ELECTRICAL REVIEW

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IN THIS ISSUE

Electrical Perspective	**839**
Improved Sewage Disposal	**841**
Starting of Induction Motors. By " Rotor "	**847**
Engineering in Europe	**853**
Personal and Social	**855**
Physical Society Exhibition	**859**
Electrical Research	**861**
Views on the News	**864**
Electrical Manufacturing in 1952	**865**
A.S.E.E. Dinner	**867**
Recent Introductions	**869**
Commerce and Industry	**871**
Next Week's Events	**876**
Large Dairy Farm	**877**
Electricity Supply	**879**
Marine Switchgear	**881**
Financial Section	**884**
New Patents	**888**
German Electrical Exports	**889**
Contract Information	**891**
Classified Advertisements	**119**
Index to Advertisers	**134**

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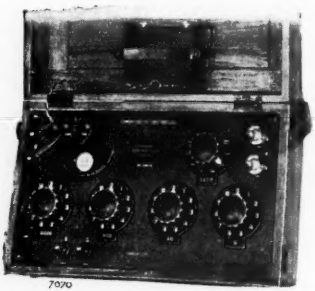

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ELECTRICAL REVIEW

17th APRIL, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 16

Electrical Perspective

ONE of the most significant events of the electrical year is the publication of the report of the British Electrical and Allied Manufacturers' Association. Produced fairly promptly after the close of the year with which it deals, it summarizes the position of the various branches of the electrical manufacturing industry and indicates the probable course of affairs during the year ahead. The 1952 report, reviewed in this issue, records a further overall advance in home and export trade but not, unfortunately, an advance in every section. For a number of familiar reasons, the domestic appliance business has been retarded and, because of a certain amount of trade recession, the demand for motors has slackened.

There is one point insisted upon in the report which may arouse some criticism. Although the consumption of electricity last year rose by only 3 per cent, the record amount of 1,540 MW of generating plant was commissioned—38 per cent more than in 1951. In spite of this the B.E.A.M.A. Council contends (and its opinion is shared by the British Electricity Authority) that nothing short of 2,000 MW a year is really satisfactory. This view is soundly based. Far too much of the existing generating plant is obsolescent and is keeping down the national thermal efficiency average. This plant must be replaced. Then the electrification of industry must proceed more rapidly if British manufacturers are to raise their productive efficiency to the extent necessary to combat foreign competition. This means that adequate power must be at their call. At the present rate of plant installation, supply is barely keeping up with the current demand—let alone providing for the future; 2,000 MW a year is by no means a too-ambitious programme.

It is true that out of peak hours there is too much generating plant at present because the domestic use of electricity has not risen as it should have done. Deliberate steps have been taken by recent Governments to curb it, upon advice from misguided or misleading

"authorities." Apart from making it difficult for the public to secure the full benefits of electricity, this policy has handicapped an important section of the electrical manufacturing industry in its endeavours to increase exports. Strong action is now being taken to restore public confidence in electricity and to secure fairer treatment for the public and the manufacturers in the matter of domestic electrical equipment. On a broader basis, B.E.A.M.A. is adopting measures to present to politicians and the public a fair picture of the whole of the electrical manufacturing industry. It is almost incredible that these efforts should be necessary in this electrical era but such is the position in which the industry finds itself. We have no doubt that concerted action will soon put things right.

TECHNICIANS

The claim that British craftsmen are the best in the world, which was made at the A.S.E.E. dinner (reported in this issue), calls for qualification in an important respect. That is, their work must be supervised by those with appropriately high technical qualifications. The greater appreciation now apparent of the urgency of the problem of training technicians in continually increasing numbers promises well for the electrical future, since neither the efforts of those responsible for drawing up schemes nor the skill of the craftsmen can be fully effective without the (in this case indispensable) middle men.

MACHINE COOLING

Six years ago consulting engineers in the United States proposed to cool large motors with water and turbo-generators with an insulating fluid. Some simplification was indicated about three years later and the employment of water vapour instead of air in the case of motors was announced from the Continent. It now seems that the largest generating set in the world is being designed with hollow stator conductors through which a liquid will be circulated, and hydrogen gas will be circulated through passages in the magnetic portions of the rotor and stator. The tandem-compound steam turbine will be rated at 208,000 kW and the alternator at 260,000 kVA. Other features of this machine are said to be the use of "improved" grain-oriented strip steel in the magnetic portions and a better type of insulation, while the new method of cooling is expected to permit a significant increase of capacity without enlarging the physical dimensions of the machine, which is to be installed by the end of 1955 in the Eastlake plant of the Cleveland Electric Illuminating Co.

PROGRESS IN GENERATION

The higher thermal efficiencies in 1952 of the twenty leading power stations in the B.E.A. table (published in our last issue) not only reflect the result of bringing new stations into commission but also indicate that several earlier modern stations have even bettered their performances. Their improved figures, however, have not prevented their taking lower positions in the list. Dunston "B," for instance, yielded the premier place it held in 1951 to another reheat unit boiler-turbine combination, Littlebrook "B," which advanced its efficiency still more. Eight stations returned over 28 per cent, as against four, and all the stations scheduled were above 26 per cent, compared with thirteen in 1951.

BRITISH INDUSTRIES FAIR

Next week's issue of the "Electrical Review" will form our annual guide to the British Industries Fair (London and Birmingham, 27th April to 8th May). Illustrated details will be given of the electrical and allied exhibits numbering about 460

Improved Sewage Disposal

New Plant Doubles Capacity of Wandle Valley Scheme

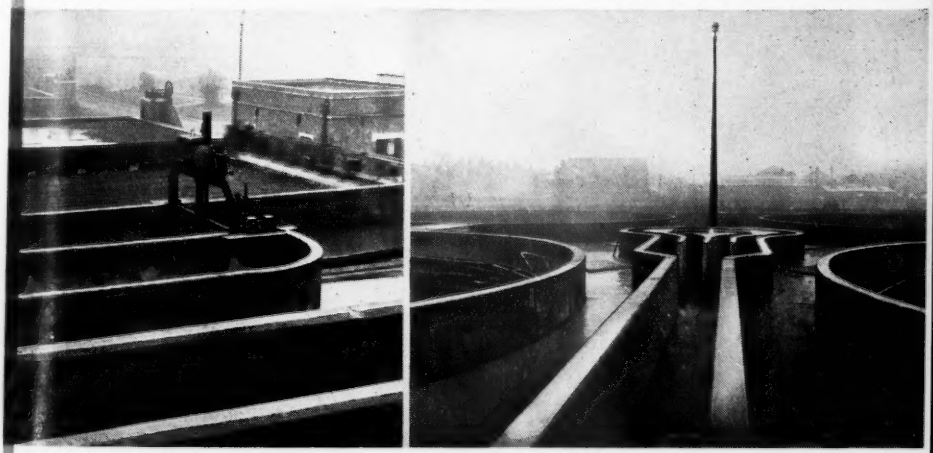
ALTERATIONS at the Wandle Valley Joint Sewerage Board's disposal works in Byegrove Road, Merton, involving the provision of sludge conditioning and bio-flocculation plant with a new pump and compressor house, sludge separating tanks, additional humus tanks, storm pumps, an effluent return system, etc., will double the capacity of the installation. The scheme, the undertaking of which was deferred because of the war, serves the area comprising the Boroughs of Beddington and Wallington and Mitcham and the Urban District of Merton and Morden, with a total population of 176,000. It is designed for a dry weather flow of 8 million gallons a day, which is considerably increased in wet weather.

Before the alterations were carried out the settled sewage from the high level sedimentation tanks went straight to the percolating filters (or bacteria beds). Now it is first pumped to the new rectangular bio-flocculation (activated sludge) unit where partial purification takes place before it is passed to the percolating filters for further treatment. There is no room on the site for further percolating filters.

To obtain a constant flow to the bio-flocculation unit the flow through the high level sedimentation tanks is controlled by means of automatic electrically operated penstocks. The high level sewage is pumped to sufficient head to flow through the bio-flocculation unit and then to the percolating filters. At the point of pump delivery mixing takes place with the settled and pumped sewage from the low level sedimentation tanks which are at a sufficiently high level for gravity flow.

The feed to the aeration tanks is controlled by an automatic penstock which can be set to operate so that it will pass any pre-determined flow between 3 million and 9 million gallons a day. Any excess flow is by-passed to the existing secondary sedimentation tanks after which it mixes with the bio-flocculation effluent before being distributed on to the bacteria beds.

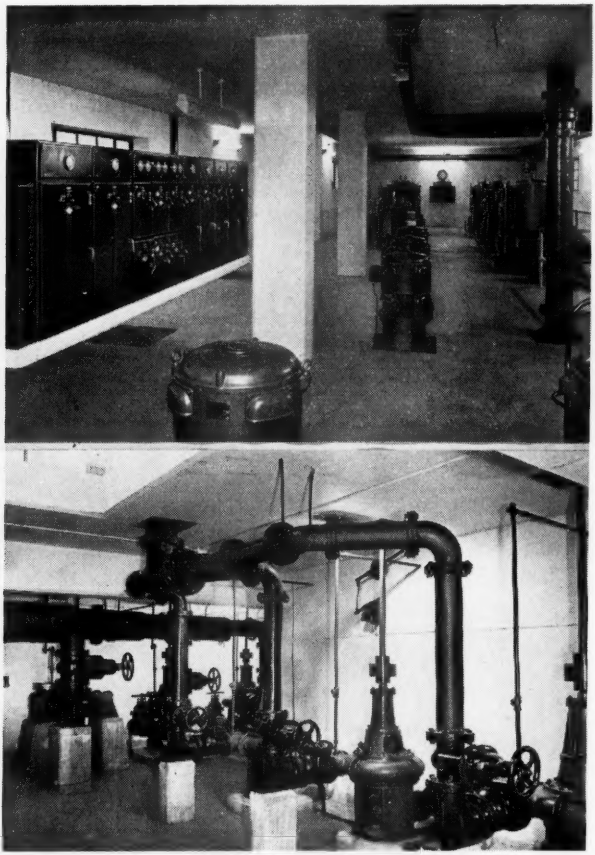
Left: **The feed to the aeration tanks is controlled by automatic penstocks.** *Right:* **Distribution chamber feeding the four new separating tanks fitted with electrically operated scraper gear. A mercury discharge lamp provides illumination**



Treatment in the bio-flocculation unit is by means of diffused air activated sludge and is divided into two equal sections, each of a capacity of 250,000 gal, giving an aeration period of one hour (6 million gallons a day). The mixed liquor is taken across the river by a concrete bridge channel and passed into four 50ft circular separating tanks fitted with Hartley's (Stoke-on-Trent) ring type scrapers. The effluent is returned across the river to a central distribution chamber whence it is taken to the bacteria beds. The activated sludge from the separating tanks returns under the river to a sump at the pump and compressor house. From here it is pumped to the roof channel and conveyed to the reconditioning tanks where it is re-aerated for 12 to 18 hours. Control of operations is effected by means of Allen West float switches in the sump.

In the new pump and compressor house, which is situated conveniently in a central position adjacent to the bio-flocculation unit and the bacteria beds, there are three 2 million gallons a day pumps (driven by 12½ h.p. 715 r.p.m. Crompton Parkinson squirrel cage motors) for taking the settled high level sewage to the bio-flocculation plant. With these are two 4 million gallons a day storm pumps (37½ h.p. 720 r.p.m. C.P. slip ring motors), three 1 million gallons a day pumps (12½ h.p. s.c. motors) for carrying the sludge from the sump to the reconditioning tanks, and five 500 cu ft/min air compressors (25 h.p. 940 r.p.m. Crompton Parkinson motors) for aerating the activated sludge. Normally three of these compressors are in operation, two being available for stand-by purposes. The "Visco" air filters on the compressors are cleaned in solvent baths electrically heated by two 3 kW "Chromalox" immersion elements.

The 400/230 V three-phase supply for the compressor and pump house is received from the London Electricity Board by two 0·3 sq in 4-core p.i.l.c.t.a. cables in parallel. A Henley 500 A 4-way



Above left: **General view of the pump and compressor house showing the air compressors, some of the pump motors, and the automatic switchboard for the motor control.** *Left:* **The basement of the pump and compressor house showing the three return sludge pumps**

Right: **Electrically operated indicators showing flow of sewage through the plant, and four of the motors driving the pumps.** *Below right:* **The storm water pump house showing the motors driving the three axial flow pumps, each of which has a capacity of 8 million gallons a day**

incoming feeder panel controls these incoming supplies and feeds out to (*a*) a 10-panel Igranic cubicle type automatic switchboard for the control of the motors of the five sewage and three sludge pumps and the compressors; and (*b*) a compressor and pump house auxiliary switchboard, comprising h.r.c. switch-fuses and distribution boards governing the separating tank motors, penstocks, high level flume, lighting and power outlets. Colour matched twin 5ft 80 W fluorescent tubes in special Courtney-Pope fittings have been installed over the switchboard and on the walls. Pyrotenax cable has been employed throughout the pump and compressor house as well as in other situations.

Lea Recorder indicators in the pump house show the sewage effluent and storm water flows in million gallons a day. A recorder house situated above the bio-flocculation tanks, besides controlling the penstocks, gives indications of the rate of flow, etc., at a number of points on the plant. The air flow through the aeration tanks is shown by means of Kent instruments.

Modifications at the high level pump house necessitated by the innovations included the provision of two new pumps (7½ h.p. motors), which involved the laying of a new cable from the L.E.B. supply.

To return now to the sewage treatment processes: effluent after it has passed through the bacteria beds is taken to the two existing humus tanks and to four new ones identical with the separating tanks already referred to. After settlement of solids, it is conveyed to a channel outside the new storm pump house and thence by gravity in two concrete conduits to the River Wandle via the North Works, which forms an extension of the original works and comprises additional bacteria beds, digestion tanks, pump house, and ancillary plant.

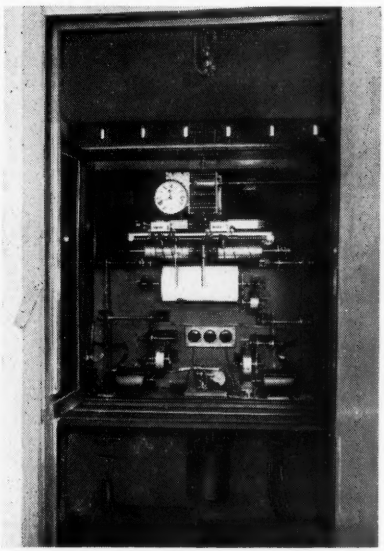
At the outlet from the sedimentation tanks at the North Works a new chamber has been built on the effluent conduits,

rom which the effluent is pumped, recorded and mixed with the sedimented sewage before being distributed over the north side bacteria beds. Pumping is carried out by three centrifugal pumps with a total capacity of 8 million gallons a day. Provision is made either for re-circulation or double filtration.

The new storm pump house, which has been constructed at the north-west corner of the South Works adjacent to the effluent conduits and the storm tanks, incorporates a new chamber from which the storm flow discharges directly to the sump. From here it is lifted by three 16in float operated axial flow pumps (47½ h.p. Crompton Parkinson motors) each capable of delivering 8 million gallons a day direct to the River Wandle, Allen West float switches in the sump being arranged to bring the pumps into operation at different water levels.

Igranic equipment is again used to control the pump motors, the electricity supply for the storm pump house being brought in through a Simplex "Monarch" 500 A main switch-fuse and Bill switch-fusegear from a Henley four-way feeder pillar mounted on the outside of the pump house wall. This is one of four similar feeder pillars with from three to six ways which have been provided at strategic points on a ring main to meet the requirements of the new plant; it also serves the new humus tanks. The other three feeder pillars serve the north effluent return pump house, the high level pump house extension, and the pump and compressor house, together with the separation tank scraper gear and new workshop and laboratories. Incidentally the workshops are extensively equipped electrically with a Berry lathe, a Quillers & Smith hacksaw, a Richmond radial drilling machine, a Pacera drilling machine and a Milford grinder, while in the laboratory are a Gallenkamp furnace drying oven and centrifuge, Charles Hearson incubators, an Edwards air and vacuum pump and Vent-Axia fans.

A recorder house situated above the bio-flocculation tanks, besides controlling the penstocks, indicates the rate of flow at a number of points



Besides covering the installation of the new treatment plant the alterations to the works have provided for improvements in the site lighting. Four G.E.C. refractor type fittings, each housing a 400 W mercury discharge lamp, have been mounted on 45ft Concrete Utilities reinforced transmission standards over the aeration tanks, two similar units being installed over the new separating tanks. Elsewhere 300 W and 500 W tungsten lamps have been replaced by 125 W mercury discharge units housed in Revo street lighting fittings. Foster low voltage handlamps have been provided in the pump and compressor house, and the storm pump, and effluent return pump houses.

The installation of the new equipment has increased the demands for electricity by approximately 50 per cent to about 850 kVA. For this reason a new transformer chamber has been provided by the London Electricity Board (South Western Sub-Area).

The transformer chamber is equipped with two Reyrolle 11 kV ring main units of the L.D.I. type, each comprising two isolators and a 150 MVA oil circuit breaker, the latter being fitted with overload and earth leakage protection. These two units are coupled together by an oil filled busbar chamber. The two Fuller 500 kVA 11 kV/433/240 V transformers provided have off-load tappings giving ± 2½ per cent and 5 per cent and + 7½ per cent.

The l.v. distribution board comprises two Lucy 800 A air circuit breakers which

ontrol the secondary side of the transformer and are arranged with intertripping ontacts and cables to the 11 kV oil circuit reakers. These Lucy air circuit breakers re connected to the distributor panel by oo A links and the outgoing cable ways omprise four 600 A 3-phase 4-wire top ntry units and three 600 A bottom entry nits. The layout has been arranged for third transformer should the load develop nd make it necessary.

The electrical installation, including the rection of the main and auxiliary control witchboards, was carried out by Buchanan & Curwen, Ltd., the London Electricity Board (South Western Sub-Area) being responsible for the underground feeder cables together with the new substation and ring main cables.

The activated sludge plant and the air compressors were supplied by Activated Sludge, Ltd., the pumping plant being made by the Pulsometer Engineering Co., Ltd. The Lea Recorder Co., Ltd., was responsible for the recording apparatus.

For assisting us in the compilation of this article we are grateful to Mr. Riley Schofield, A.M.I.C.E., surveyor to the Wandle Valley Joint Sewerage Board, who was responsible for the preparation and installation of the works extensions; to Mr. Cyril Rogers, A.M.I.S.P., the works manager; and Mr. H. S. Redwood Burt, of Buchanan & Curwen, Ltd.

Public Electricity Supply

RELATIVELY few books dealing with the numerous practical aspects of electricity supply service are available and the three latest volumes* in the Newnes Practical Electrical Engineering Series are welcome additions to their number.

The first book under notice starts with a comprehensive article on the modern generating station, which covers the main features in a clear and logical way, including typical capital and operation costs for a 150 MW plant. No mention is made of the physical or other limitations of mechanical stokers which have been responsible for the marked trend towards pulverized fuel firing. Presumably that was left to an article on steam raising, in which, however, it is not discussed; nor is the effect of the fouling of interior surfaces on boiler availability, which so materially contributes to reduction of the number of boilers. Space given to descriptions of other types than the water-tube boiler might well have been saved.

Sections on the design and the operation and maintenance of turbo-alternators, good as far as they go, are concerned mainly with the electrical end and such problems as those arising out of differential heating of the metal of large turbines are not considered. Two short sections discuss the duties of a shift-control engineer and a shift charge engineer. In a section on fire protection three different systems in common use and their several applications are considered. The volume concludes with a chapter on hydro-electric stations, which surveys the spheres of usefulness of the three main types of turbine including the modern Kaplan turbine with variable-pitch blading.

The second book, " Power Transmission Engineering," reaches a consistently high standard. It deals first with construction and maintenance of overhead lines in two practical articles. Power cables at very high voltages have an importance that is far greater than their installed route mileage might suggest and the various types and reasons for the techniques adopted are likewise authoritatively dealt with. Chapters on static substations and types and maintenance of high voltage switchgear are also good.

A final section describes in detail protective relays with their applications, and methods of testing and maintenance. The more specialized arrangements employed for the 132 kV grid and such matters as bus-zone protection are outside the scope of the book.

* " Power Station Work " (pp. 164, illus. 119); " Power Transmission Engineering " (pp. 180, illus. 157); " Electricity Supply Engineering " (pp. 164, illus. 213). Edited by E. Molloy. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 17s 6d each.

The title of the last book, "Electricity Supply Engineering," is used in the reasonable sense of distribution by the Area Boards to consumers, but it is related to the whole national scheme in an introductory article. Apart from the scant treatment of supplies to factories, the subsequent articles offer little scope for criticism, as they deal with the many aspects in an efficiently detailed manner. They cover underground (high- and low-voltage) urban and rural systems, connections for individual supplies, cable laying methods, fault localization, remote control of substations and consumers' apparatus, and there are notes on tee-service and aluminium cable jointing.

The 24 contributors to the three books have between them provided information likely to be of value to the specialist or to the general technically trained reader. The illustrations generally have been well chosen for their instructional value.

Electromagnet for Furnace Charging

AT the Birmingham works of Tubes, Ltd., a water-cooled magnet, designed and made in the Witton-Kramer electric tool and hoist works of the G.E.C., has recently been commissioned for charging billets into a rotary hearth furnace, the furnace, charge and discharge machines having been built by the Salem Engineering Co., Ltd.

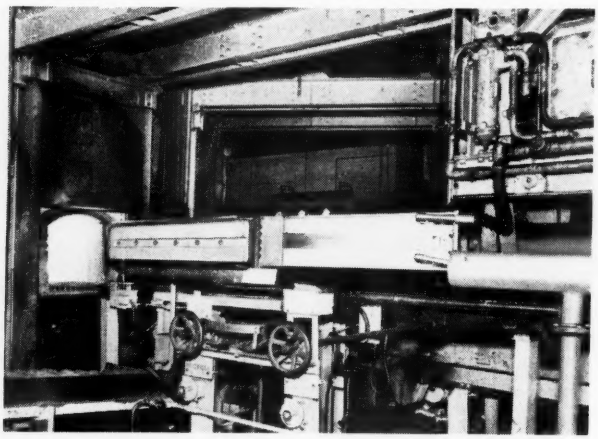
The magnet, which is wound for service on a 220 V d.c. supply, weighs about 15 cwt, and is capable of handling billets ranging from 3½in to 4in diameter up to 5ft long. A selenium metal rectifier fed from the 400/440 V, three-phase works supply provides d.c. for the magnet which is governed by a master controller and contactors.

The conventional method of charging rotary hearth furnaces is by means of a machine provided with a mechanically controlled extension arm fitted with grips to handle the billets, so this installation is an extension to the field of service of the lifting magnet.

The magnet offers two important advantages. First the billets can be charged with their ends touching, thus giving a better hearth loading and secondly, as more than one billet can be picked up at a time, the furnace has to be charged less frequently, resulting in less wear and tear on the charging machine and reduced heat losses.

As the magnet has to be inserted into the furnace, its design and construction must be such that it will withstand temperatures of the order of 1,000 deg C without detriment. Satisfactory performance of the magnet at these high temperatures has been achieved by providing water jackets along each side of the magnet and extension arm of the charge machine, independent water circulation being provided for each cooler.

The cold billets to be charged into the furnace may vary in length from 1ft to 5ft, and the continuity of the poles over the whole length of the magnet permits billets of the same diameter but of different lengths to be handled simultaneously.



Rotary hearth furnace charging equipment employing a G.E.C. water-cooled lifting magnet at the works of Tubes, Ltd., Birmingham

Starting of Induction Motors

The Limitation of Heating

By "ROTOR"

IF a motor is not used in the way intended by the designer it may exceed the expected temperature and premature failure may occur; in some cases there may be risk of fire. In practice it often happens that the operating conditions are, in fact, unfavourable to the motor.

Direct-on-line Starting

When a motor is started it normally takes more than full load current to accelerate from rest. In the case of a squirrel-cage motor which is started by direct-on-line switching the initial current may be 5 to $7\frac{1}{2}$ times full load current as shown in Fig. 1. Under these conditions the initial rate of heat generation, which is proportional to the square of the current, will be from 25 to 56 times the normal rate.

Since there is little or no windage until the motor accelerates, this high rate of heat generation occurs when the rate of heat dissipation from the motor is low and cannot be permitted to continue for very long, especially in the case of a high-speed ventilated or fan-cooled motor which has a comparatively short heating time-constant. As the motor accelerates the current and the rate of heat generation fall, while the rate of cooling increases. On a given voltage and frequency an induction motor takes a definite value of current at each speed. The rate of acceleration of the motor is proportional to the accelerating torque, i.e., to the amount by which the motor torque exceeds the resistance torque of the load, and is inversely proportional to the inertia of the rotor and coupled load. The motor torque obtainable with a given method of starting depends on the design of the motor, as indicated in Fig. 1, while the inertia of a rotating body is proportional to Mk^2, where M is the mass of the body and k the radius (of gyration) at which the mass may be considered to act.

To avoid risk of overheating during starting, the starting period of a motor which is switched direct on to the line should not exceed $\left(15 + \frac{\text{h.p.}}{4}\right)$ sec. Thus, a 2 h.p. motor should reach full speed within $15\frac{1}{2}$ sec and a 40 h.p. motor should reach full speed within 25 sec. These values are

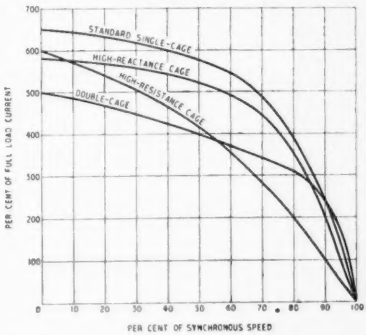


Fig. 1—Current-speed curves for four types of three-phase squirrel-cage motors when switched direct-on-line

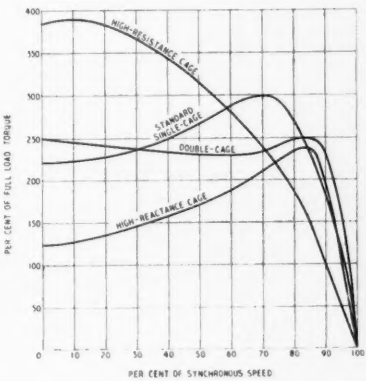


Fig. 2—Torque-speed curves for four types of three-phase squirrel-cage motors

based on an initial starting current (short circuit current) of not more than six times the full load current.

Fig. 2 shows the speed-torque characteristics of four types of three-phase squirrel-cage motor when started by direct-on-line switching on to normal voltage. In the double-cage motor the outer cage of the rotor carries a large proportion of the rotor current when started from rest. The "Trislot" rotor has three cages; the outer one has a comparatively high resistance and may be of copper or some material of high resistivity such as a nickel alloy. While the greatest rate of heat generation at starting occurs near the periphery of the rotor, where the heat dissipation is good, the outer conductors may tend to overheat if the starting period is unduly prolonged.

Causes of Faulty Direct-on-line Starting

Normally, direct-on-line starting will provide adequate starting torque to enable a motor to accelerate its load quickly, but this may not be the case under unfavourable conditions. For instance, the motor may fail to start, or the starting period may be unduly prolonged, due to such causes as stiff belts as may occur after a long stoppage, inadequate lubrication, maladjustment or mechanical defect in the driven plant, due to the motor having stopped or been stopped on load when it should first have been unloaded ready for restarting, or similar causes.

The starting torque of an induction motor at any speed is practically proportional to (stator voltage)^2, and thus may be reduced if the voltage is low due to supply variation, or because there is an abnormally high volt drop on the cables to the motor resulting from their being too small for their length or wrongly installed so that there is an appreciable reactance volt drop as well as the resistance volt drop. It is advisable that the size of the cables be such that the volt drop from the service point to the motor terminals when full load current flows does not exceed $7\frac{1}{2}$ per cent of the supply voltage. In some cases much lower volt drops are advisable. Since the cable volt drop is proportional to the current, a much higher volt drop may occur at starting than when running on full load; this may reduce the starting torque appreciably. Where the cable volt drop is appreciable it may be a good plan to employ a high-torque double-cage squirrel-cage motor since, in addition to having a high $\frac{\text{torque}}{\text{current}}$ ratio at starting, such a motor has a lower starting current than a standard motor, as may be seen from Fig. 1, and thus has a lower cable volt drop at starting. In the event of trouble at starting due to low voltage it is often helpful to start the heavily loaded motors first, before the cables have been loaded with the running currents of other motors.

If a motor is used on less than its rated voltage it will naturally develop less than its rated starting torque, and there may be starting difficulties. A similar reduction of starting torque will occur if a motor is used on more than its rated frequency. Hence it is important that the voltage and frequency of each motor should correspond with the normal supply values, especially if the supply voltage should at times be appreciably lower than the declared value, as is by no means uncommon these days. A motor may fail to start due to serious unbalance of line voltage, or to an open circuit in one line as may occur because of a melted fuse, faulty contact, etc.

A motor is likely to burn out very quickly if it is allowed to remain stalled with current flowing through its windings; it may also be burned out by prolonged starting, or repeated unsuccessful attempts at starting. It is, therefore, important that operators should immediately report all cases of faulty starting to a competent person.

In some cases faulty starting can be dealt with by pulling the belts round by hand before switching on, in order to spread the lubricant over the working surfaces, particularly if the trouble occurs after a prolonged stoppage. In some cases the torque of an induction motor increases as the speed rises from zero so that, in an emergency, a motor will sometimes continue the acceleration and run satisfactorily if it is assisted by pulling on the belts until it has reached a certain speed, if it will not start otherwise. In some cases the starting load can be reduced by arrangement or unloading of the plant such as by suitable adjustment of the valves of pumps and compressors, compression relief valves, etc. If the motor is not run continuously, as in the case of an automatically controlled compressor motor, a solution to the problem

may be to fit a smaller pulley on the motor. This will reduce both the starting and the running load, but will necessitate the motor running for longer periods to do the same amount of work as before.

Since a motor develops a very high torque, up to its pull-out torque, after it has been allowed to accelerate to more than about 80 per cent of synchronous speed, it can then generally accelerate a very heavy load if this load is applied gradually by means of a hand or centrifugal clutch or fast-and-loose pulleys, after the motor has been allowed to run up to a steady speed on light load.

Types of Starting Loads

In general industrial drives can be roughly placed in four groups as follows:—

(*a*) Starting torque roughly constant at full load value at all speeds.

(*b*) Starting torque roughly constant at about 40 per cent of full load torque, the full load being applied after the motor has accelerated to full speed.

(*c*) Starting torque roughly proportional to speed.

(*d*) Starting torque roughly proportional to square of speed.

Furthermore, extra torque is generally required to overcome the static friction of the drive, while the motor torque must exceed the resistance torque of the load at all speeds to provide an accelerating torque for bringing the motor and load from rest to full speed in a reasonably short time.

If a motor has to start against full load torque a machine with a high reactance rotor will not generally be suitable as its starting torque is inadequate, although it may be suitable for loads in groups (*b*), (*c*) and (*d*), when started direct-on-line. A standard or a double-cage motor with direct-on-line starter is generally suitable for on-load starting of lifts, hoists, reciprocating pumps or compressors. Direct-on-line starting with a standard motor is generally suitable for starting a motor with a high inertia load such as a centrifugal blower, centrifuge, hydro-extractor, or machines which have a heavy rotating mass at a comparatively large radius, such as flywheels; while the resistance torque of such loads is low at starting a fairly high starting torque is required to reach full speed in a reasonably short time.

Generally, however, supply authority restrictions limit the size of induction motor which can be started by means of direct switching on to their mains to no more than about 3 to 20 h.p., depending on the capacity of the supply plant and mains, so as to minimize the momentary fall of line voltage. In order to comply with such requirements it may be necessary to start an induction motor on reduced voltage, which lowers the starting torque practically in proportion to the square of the voltage applied to the stator windings. The starting current in the motor windings is reduced approximately in proportion to the voltage applied to the winding.

The voltage at the stator windings can be reduced by connecting resistors in series with these windings, but this method is inefficient on account of the losses which occur in the starting resistors. In consequence, if the line current is reduced to one-third of the direct-on-line value with one-third of line voltage at the motor windings the starting torque will be reduced almost to one-ninth of that obtained by direct-on-line starting. This method is thus only suitable for light load starting, but is used on some drives which require smooth and gradual starting under the control of the operator.

Choice of Starter

In view of the probable short-time rating of the resistance units it is important that the correct type of starter be chosen in order to avoid overheating of the resistors during starting. For instance, an ordinary-duty starter may serve if the motor is normally started up not more than twice per hour with no more than full load current and a starting time of not more than 10 sec for motors of up to 10 h.p. An intermittent-duty starter may be required for a motor which starts up to 15 times an hour, or a frequent-duty starter for a motor which starts up to 40 times an hour. Should the motor refuse to start when switched on there may be some risk of burning out the resistors of the starter. The remedy may be to reduce the value of the starting resistor, or fit another type of starter or a motor with a higher ratio of starting torque to starting current, such as a high-torque motor.

A common method of reduced voltage starting which is often used with motors up to about 40 h.p. is the star-delta method, which is applicable to a motor which has both ends of each phase of the stator

windings brought out to terminals, with windings which are intended to be connected in delta for running. In the starting position the starter connects the phases of the stator windings in star, so that each phase of the windings is subject to 58 per cent of the line voltage. Thus the motor develops about one-third of the torque which it would develop when switched direct-on-line with the stator windings delta-connected. The reduced starting voltage increases the starting period, but the method is suitable for use with a standard or high-torque motor for light load starting or for a centrifugal pump or other loads falling in groups (*c*) and (*d*). The normal design of star-delta starter does not contain resistors or other short-time rated devices, but it is advisable that the starting period should not greatly exceed the time allowed for direct-on-line starters, i.e. $\left(15 + \frac{\text{h.p.}}{4}\right)$ sec.

Fig. 3 illustrates star-delta starting of a standard single-cage motor coupled to a centrifugal pump. It will be noted that the motor torque in star exceeds the pump load resistance torque up to 85 per cent of synchronous speed, so the motor should accelerate to this speed in the starting position. The starter is then thrown quickly into the running position in which the stator windings are connected in delta. The motor develops no torque during the change-over so this should be made quickly to minimize loss of speed. If the stator windings are reconnected to the supply at 83 per cent of synchronous speed they will then take 173 per cent of the current which flows in each stator winding at the same speed with the star connection, in this case about 350 per cent of full load current. The increased motor torque will then quickly cause the motor to accelerate to full speed. In Fig. 3 the shaded area represents the power used in accelerating the rotor and coupled load. It may be seen from Fig. 3 that if the starter is thrown into the delta position before the motor has accelerated to a steady speed, or if the speed is allowed to fall unduly while changing over, the stator current will be increased on reaching the running position.

In the starting (star) position the line current to the motor is the same as the current in the phases of the stator windings, while in the running (delta) position the line current is 173 per cent of the current in the stator windings.

In the event of failure to start or excessive starting period the remedy, as in the case of the direct-on-line starter, may be to reduce the starting load or to fit a motor of higher starting torque, or possibly a motor of greater horse-power if the machine is well loaded, or else to increase the starting torque of the existing motor by applying a higher voltage at starting, as may be done by using an auto-transformer starter. However, the practical remedy in the case of the star-delta starter is usually to put the

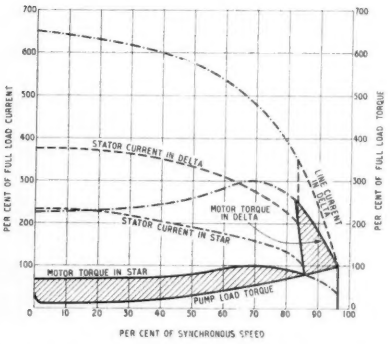

PER CENT OF FULL LOAD CURRENT
PER CENT OF FULL LOAD TORQUE
STATOR CURRENT IN DELTA
LINE CURRENT IN DELTA
MOTOR TORQUE IN DELTA
STATOR CURRENT IN STAR
MOTOR TORQUE IN STAR
PUMP LOAD TORQUE
PER CENT OF SYNCHRONOUS SPEED

Fig. 3—Star-delta starting of a typical single-cage three-phase motor coupled to a centrifugal pump

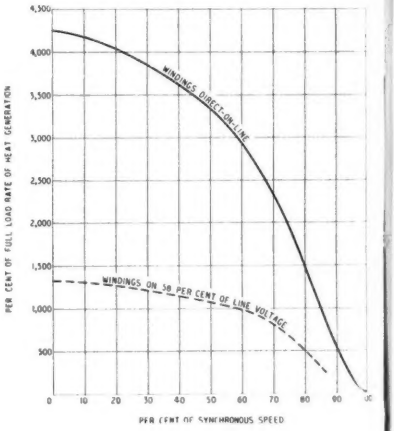

PER CENT OF FULL LOAD RATE OF HEAT GENERATION
WINDINGS DIRECT-ON-LINE
WINDINGS ON 58 PER CENT OF LINE VOLTAGE
PER CENT OF SYNCHRONOUS SPEED

Fig. 4 (*right*)**—Rate of heat generation in a typical three-phase squirrel-cage motor**

starter into the running (delta) position if the motor fails to get away in the starting position, thus increasing both the starting torque and the line current at starting to about three times the star-connected values. One disadvantage of the latter method is that it may necessitate increasing the setting of the overcurrent trips to avoid tripping at starting. It may also result in strain on the mechanical power transmission in view of the high starting torque.

Auto-Transformer Starting

The auto-transformer starter is suitable for motors of various sizes, but is seldom employed for machines below 10 h.p. It can be used for light or partial load starting, and is suitable for polyphase motors having only three stator terminals and in cases where the starting torque obtainable by a star-delta starter is too low. It can also be adopted to apply a low starting voltage to give a low starting torque to a motor which starts on light load or requires smooth starting. The general arrangement of this starter is similar to that of a star-delta starter in that it has a starting (low voltage) position and a running (full voltage) position. In the starting position a reduced voltage is applied to the motor from tappings on the auto-transformer; while in the running position the auto-transformer is de-energized and the motor fed direct from the supply. The transformer may have three or more sets of tappings, which may be at 40, 60 or 75 per cent of line voltage, giving starting torques which are almost proportional to the square of the voltage.

It is important that the starting period with an auto-transformer starter should not be unduly prolonged, otherwise the short-time-rated auto-transformer may be damaged by overheating. An ordinary-duty starter is suitable for up to two starts per hour, with starting periods of no more than 15 sec for motors up to 20 h.p. or 5 sec plus 0·5 sec for each h.p. for motors of 20 to 50 h.p. or $\left(25+\frac{\text{h.p.}}{10}\right)$ sec for larger motors.

An intermittent-duty starter is suitable for not more than five starts per hour, with total starting period not more than 1 min in 15, and no sequence of starts in excess of 1 min without a cooling period. A frequent-duty auto-transformer starter can be used for up to 40 starts per hour if the total

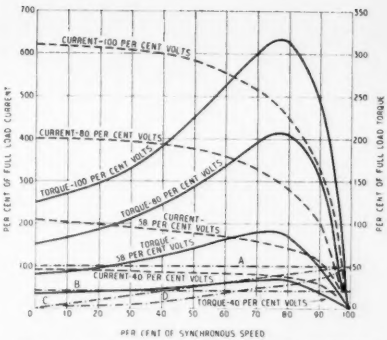


Fig. 5—Line currents and torques of a typical 50 h.p. three-phase motor at various voltages with auto-transformer starting

starting period is no more than 2 min in every 15, and no sequence of starts exceeds 2 min without cooling. In the event of the motor refusing to start, or the starting period being too long, the remedy may be to reduce the starting load, or to increase the starting torque by using a high-torque motor, or to increase the starting voltage by changing to a higher voltage set of taps on the auto-transformer. Fig. 5 shows the starting torque and currents at various voltages when auto-transformer starting is applied to a standard motor. The curves A to D also refer to four load groups. It will be noted that a 58 per cent starting voltage, which corresponds to star-delta starting, will not develop sufficient torque to start a group (*a*) (full load torque) load.

Slip-ring Motors and Starters

A slip-ring motor normally develops a high starting torque with a reasonably low starting current, but the starting torque will be reduced if the voltage at the stator windings is low, as in the case of squirrel-cage motors. The starting conditions with a particular motor started against full load torque are represented in Fig. 6. If the supply voltage is reduced the angles $\alpha_1\alpha_2$, etc. will be reduced, thus lowering the starting torque and peak torque on each set of rotor starter contacts. The rotor circuit resistors may be overheated if the starting is unduly prolonged, whether due to low voltage or otherwise. With a high value of rotor circuit resistance, as is required to give a reasonably low starting current, the peak torque of the motor will probably be obtained at standstill on rotor

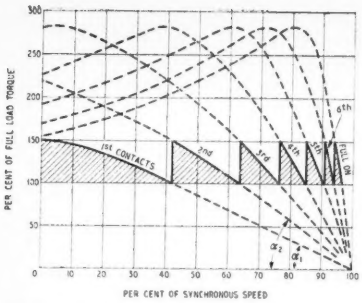


Fig. 6—The starting of a typical three-phase slip-ring motor against full load torque

starter contacts past the first ones; with the starter in question it may be seen that the peak torque occurs at standstill on normal voltage with the rotor starter on the third set of contacts.

Thus if a motor fails to start on the first step of the rotor starter, because of increased load, reduced voltage or otherwise, and the load cannot be reduced, an increased starting torque can generally be obtained by moving the rotor starter over towards the full-on position. This will naturally increase the starting current.

In order to avoid overheating of the starter in normal or abnormal conditions the rotor starter must be of the correct rating for the duty. For not more than two starts per hour an ordinary-duty starter may be used if the motor can reach full speed from rest with full load current in no more than 10 sec for motors up to 10 h.p. or $\left(5+\frac{\text{h.p.}}{2}\right)$ sec for motors of 10 to 50 h.p. or $\left(25+\frac{\text{h.p.}}{10}\right)$ sec for larger motors up to 500 h.p. Intermittent-duty rotor starters are suitable for up to 15 starts per hour if the total starting period is not more than 1 min in 15 and the starter is not used consecutively for more than 1 min without cooling. A frequent-duty starter is suitable for up to 40 starts per hour if the total starting period is not more than 2 min in every 15 and the starter is not used for more than 2 min without cooling.

Trade Mark Infringement

IN *Electrolux, Ltd.* v. *Electrix, Ltd.*, in the Chancery Division of the High Court on 1st April, Mr. Justice Lloyd-Jacob decided that the defendants had infringed the plaintiffs' registered trade mark "Electrux" by using the unregistered mark "Electrix" in relation to vacuum cleaners.

The plaintiffs alleged infringement of their three trade marks "Electrolux," "Elektrolux" and "Electrux." In regard to the first two marks, it was revealed in evidence that, in 1946, the defendants were contemplating putting an "Electrix de Luxe" cleaner on the market, and pamphlets were printed using that name. Shortly afterwards the name was changed to "Silent Electrix," and obliteration slips were pasted over the words "de Luxe." Some of these pamphlets had been distributed in 1947 without the slip, but the Judge held that any infringement so caused was trifling and he was satisfied that it was inadvertent.

The "Electrux" mark was first registered in 1928, but was not used in relation to vacuum cleaners until 1947. The Judge was unable to hold that, as the defendants alleged, the mark had been registered without a bona fide or honest intention of using it. "Electrix" had been used since 1934, and the question was whether it was an infringement of "Electrux" as "so nearly resembling it as to be likely to deceive or cause confusion." There was a confusing similarity between the marks and, although there was no occasion when customers were actually deceived, His Lordship held that there had been an infringement.

An order was therefore made for an injunction to issue restraining the defendants' use of "Electrix" in relation to vacuum cleaners, for an account of profits in respect of the infringement, and for the destruction of advertising matter containing the word "Electrix" applied to cleaners. It was further ordered that the Register was to be rectified so as to exclude "Sprayer units sold as separate devices" from the categories of apparatus covered by the mark "Electrux." The plaintiffs were awarded three-fifths of their costs of the hearing.

The Judge considered that the mark "Electrix" might be entitled to be registered. "Electrix" vacuum cleaners had been on offer for the past 20 years, and when introduced the defendants were honestly ignorant of "Electrux"; non-use of the latter mark until 1947 was a special circumstance to be taken into account. Registration was a matter for the Registrar, and the order would be stayed provided the defendants applied with all due diligence for registration of "Electrix" in connection with vacuum cleaners, and, meanwhile, accounted for sales of "Electrix" cleaners.

Engineering in Europe

Survey of Current Literature

SECTIONS of cable are inserted into the overhead lines of medium-voltage systems mainly at crossings with roads, railways, telephone and h.v. lines, or at the lead-in to substations. They may be stressed by voltage surges produced by lightning strokes to the earth wires or masts with back flash-overs to the line conductors, or else by switching surges at the operating frequency or higher frequencies up to several 1,000 c/s. Even the latter may reach amplitudes of 5–6 times the peak value of the conductor-earth voltage. Although the general character of the primary disturbance and its special characteristics may widely differ, its propagation will always be by travelling waves and the behaviour of a cable in a line when a travelling wave impinges on it may be reduced to three or four typical cases and is easily predictable inasmuch as the transmission and reflection processes are susceptible of a simple theoretical treatment.

The characteristic impedance of a cable is $\sim 50\Omega$ and its capacitance and the impulse breakdown characteristic of its insulation can be determined. Thus comparatively simple considerations show that cables inserted in overhead lines may have the service rating corresponding to the operating voltage of the system if the following conditions are satisfied: (a) the near end of the cable must be protected by surge divertors which may be of the expulsion gap type; (b) over a length of at least 300 m before the cable section the overhead lines must have earth wire protection against direct strokes to the conductors. The earth wire must be reliably earthed at every mast for the prevention of back flash-overs. If surge divertors are not provided the cable must have a service rating higher than the operating voltage of the system. These considerations disregard the attenuation of surge waves by long cables which constitutes an additional safety factor.—" Surge Protection of Cables inserted into Medium-Voltage Overhead Lines," H. Grunewald, *Elektrizitätswirtschaft*, Vol. 51, No. 22, pp. 604–608, November, 1952, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. — Editors, *Electrical Review*.

Commutator Scoring

Scoring of commutators by extraneous causes may be avoided if they are protected from dust and oil mist deposits. The effects of gases may be counteracted by using electro-graphitic brushes alternating with brushes of natural graphite. If d.c. machines have to work in a damp atmosphere, brushes of a kind possessing a certain cleaning effect should be used. Internal causes of scoring may also be eliminated by matching the material of the commutator and sliprings with the brush material and by reduction of the number of brushes. Scoring dangers exist with d.c. machines if the following conditions obtain: roller bearings; brush current density < 5 A/cm^2; peripheral speed of commutator < 20 m/s; moisture content of air < 10–12 g/m^3. Scoring is, as a rule, not a continuous and progressive process, but mostly only temporary, particularly affecting freshly ground commutators. Dangers to commutators or shortening of the service life of commutators and sliprings by scoring are therefore a rare occurrence.—" Scoring of Commutators and Sliprings when Electro-graphitic Carbon Brushes are used," O. Bielefeldt, *E.T.Z.* (A), Vol. 74, No. 2, pp. 36–40, 11th January, 1953, in German.

Transformer Error Compensation

The compensation method suggested and described by these authors is now fairly generally used in the U.S.S.R. on mass-produced current transformers up to 10 kV. The method consists in producing in the transformers a leakage field linking with the secondary winding in a particular way and pre-magnetizing the transformer core. This is obtained by magnetic shunts of a special design and by dividing the secondary

winding into two series-connected coils placed on different limbs of the core. The primary winding surrounds one of these limbs, or forms a rail crossing the window of the transformer core.

The parallel or perpendicular arrangement of π-shaped shunts (iron brackets) with respect to the plane of the transformer core has to be used according to the particular type of the transformer, i.e. the relative positions of primary and secondary windings; additional compensation in the form of a short-circuited turn on one of the core limbs may be used. At the rated current the magnetic shunt is usually saturated and has therefore small influence on the equivalent reactance and resistance of the secondary winding. When the primary current is reduced the relative effect of the magnetic shunt on reactance and resistance of the secondary winding increases, so improving the error characteristics of the transformer. The latter may be adapted to the conditions of operation of the transformer and in this way permits of economies in the materials going into the transformer, the size of which may be reduced.—" Current Transformers with Error Compensation by the MEI-Method," G. N. Petrov and S. S. Okun, *Elektrichestvo*, No. 12, pp. 14–21, December, 1952, in Russian.

Testing Plastics

This author deals with criticism levelled at standardized testing methods for plastics and points out that many of the critics do not seem to be aware of the impossibility of applying to plastics criteria of strength which are appropriate for metals, and maybe not even for all metals. The homogeneity of plastics in general is far too low and the anisotropy, mostly due to production processes, of much too high an order to allow of establishing " constants of the material " such as tensile, shear, or bending moduli, as standards for plastic materials. Also the strong climatic influences on plastics make it nearly impossible to achieve the necessary weight constancy which must precede every creep test to make the result significant at all.

Another question is that of freedom from internal stresses which is only obtainable by polymerization of the final product from its constituents without yield. This applies only to such materials as plexiglass or polymethacrylates. Interesting examples are given from the author's practice in the German Materials Testing Institute on all kinds of mechanical, thermal, optical and climatical (cooking) tests, from which the great anisotropy of all the materials is evident. Much structural improvement of the plastic materials will be needed before exact and conclusive testing methods and test standards are possible.—" Some Actual Problems of Testing of Plastics," R. Nitsche, *Kunststoffe*, Vol. 42, No. 12, pp. 427–433, December, 1952, in German.

Capacitor Choice

The many widely different purposes for which capacitors are used nowadays and, above all, the great variety of capacitor types so used, render it impossible to determine their sizes and characteristics by the simple conventional formulæ which are based on the parallel plate or cylindrical type of capacitor. A detailed analysis and comparison of the specific characteristics of the various types with recommendations for possible improvements of some types is therefore presented by the author, who considers the following typical cases:—

(1) Capacitor of comparatively large capacitance for *l.v.*, d.c. or l.f. work; reactive power small, temperature rise negligible; (2) *h.v.*, d.c. or l.f. work, small capacitance, temperature rise negligible; (3) capacitor carrying high reactive load (fairly high voltage and large capacitance at low frequency, or high operating frequency at small capacitance), temperature rise due to dielectric losses must be considered.

The first interesting point is the specific volume referred to unit capacitance, or its reciprocal (capacitance per unit volume) which are actually also functions of the operating voltage, as well as characterizing the special type of capacitor. Furthermore, the specific energy storage capacity (J/cm^3) is a function of operating voltage and capacitor type. The last, and probably most important, characteristic is specific volume per unit reactive power and specific reactive power in relation to frequency. The diagrammatic representation of these relations is a great convenience for the selection of capacitor types (systems) for any particular purpose.—" Specific Characteristics of Capacitors," V. T. Renne, *Elektrichestvo*, No. 12, pp. 47–53, 1952, in Russian.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the annual general meeting of the Association of Short-Circuit Testing Authorities, held on 19th March, **Colonel B. H. Leeson**, O.B.E., T.D., President I.E.E., was re-elected chairman of the Association for the current year.

Mr. J. F. Veevers has been appointed managing director of Peto Scott Electrical Instruments, Ltd.

Mr. E. A. Norris, home sales manager of R. H. Windsor, Ltd., who has been with the company for fourteen years, has retired from active work, but he will continue as technical sales consultant. Two presentations have been made to him at the company's works, one from the company and the other from executives and staff. **Mr. G. T. Windsor**, brother of Mr. R. E. G. Windsor, the managing director, has taken over the position of home sales manager.

Mr. M. K. Kaye, press officer of E. K. Cole, Ltd., is shortly to relinquish this post to become deputy general manager of Turner's Lighter Spares & Components, Ltd.

Mr. C. L. G. Fairfield, M.A., M.I.E.E., A.M.I.Mech.E., Barrister-at-Law, has joined the Telegraph Construction & Maintenance Co., Ltd., as manager of the overseas division. Mr. Fairfield will be responsible to the managing director for the organization of the division and the co-ordination of the activities of, and liaison with, overseas agents and associates, with control of export sales. **Mr. A. W. J. Cordrey** will continue as export sales manager and his activities will remain unchanged.

After taking an honours degree in mathematics and mechanical sciences at Cambridge, Mr. Fairfield served an apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd. He held several positions with the Central Electricity Board between 1935 and 1945, and subsequently was with Balfour Beatty & Co., Ltd., for two years. He has been with Mullard, Ltd., from 1947 to the present time, latterly as manager of the valve division. He was also, at one time, secretary of the Mullard group of companies, a director of Mullard Equipment, Ltd., and a Mullard representative on the board of Telcon Telecommunications, Ltd.

Telcon Telecommunications, Ltd., owned jointly by Mullard, Ltd., and the Telegraph Construction & Maintenance Co., Ltd., announces the appointment of **Mr. Wilfred Sampson**, B.A., A.M.I.E.E., as commercial manager. Mr. Sampson was educated at Oundle and Queens', Cambridge, and joined the transmission systems division of Standard Telephones & Cables, Ltd., in 1929, with which company he gained experience in the field of telecommunications both in this country and abroad, particularly in South Africa. He will be responsible for the commercial management of T.T.L. under the managing director, Mr. J. Innes, C.B., while Dr. K. E. Latimer will continue as technical manager responsible for engineering projects handled by the company.

Mr. C. L. G. Fairfield

Mr. W. Sampson

Henry Meadows, Ltd., announces the following new appointments:—**Mr. E. H. L. Cooper** to be general works manager; **Mr. J. R. Threlfall** to be production manager; **Mr. G. Metcalfe** to be production controller; **Mr. D. E. Mallet** to be chief inspector; and **Mr. H. D. Prescott** to be assistant chief inspector.

A canteen of cutlery has been presented to **Mr. A. A. Millar**, electrical engineer for the Cumberland area of the Northern Division, National Coal Board, who is leaving to take up a similar post in the West of Scotland Division. The presentation was made by Mr. J. Pattinson, area president of the Association of Mining Electrical and Mechanical Engineers.

Mr. A. W. Terrey has retired from the position of station superintendent at Southampton power station and has been succeeded

by **Mr. G. W. Manley,** deputy station superintendent at Little Barford. Mr. Terrey joined the Southampton Corporation electricity undertaking in 1912 as switchboard attendant and held various positions until his appointment as station superintendent in 1947.

Mr. T. H. Wood, M.I.Mech.E., A.M.I.E.E., chief generation engineer (construction), South Wales Division, British Electricity Authority, is to retire at the end of the present month. After training with a private company, Mr. Wood joined the Sheffield Corporation, where he was engaged on the design of the Neepsend power station, and then became an engineer with the Doncaster Corporation, being principally connected with the alteration of the distribution system from d.c. to a.c. From Doncaster he went to Battersea, where he carried out extensions to the Battersea Council's power station. In 1919 he was appointed chief technical assistant at Newport and, early in 1944, became borough electrical engineer and manager to the Newport Corporation, a position he held until the electricity supply industry was reorganized in 1948.

Mr. T. H. Wood

Mr. J. H. Wilkes, district installation engineer, Isle of Wight District, Southern Electricity Board, was entertained to a dinner by eighty of his colleagues on 8th April, and presented with a cheque from them by the district manager, Mr. E. Jordan, M.I.E.E., to mark his retirement after over fifty-one years' service in the Isle of Wight. Mr. Wilkes served his apprenticeship with the original Isle of Wight Electric Light & Power Co., Ltd., and held the position of branch manager at Ryde at vesting day, subsequently being promoted to district installation engineer.

Mr. W. H. Howard, A.M.I.E.E., has been appointed deputy engineer, Glasgow Sub-Area, South West Scotland Electricity Board. He was previously senior assistant (planning and development) at the Board headquarters and with the Sub-Area. He had earlier service with the North Wales Power Co., Dundee Corporation and North of Scotland Hydro-Electric Board.

The London Electricity Board has appointed **Mr. W. J. Sageman,** A.M.I.E.E., as manager of the Wimbledon-Mitcham District, and **Mr. F. A. Geary,** M.I.E.E., as manager, Battersea-Wandsworth East-Wandsworth West District. **Mr. A. Webber,** the former South Western Sub-Area engineer, will continue to be generally responsible for the reorganization of the South Western Sub-Area until such time as Messrs. Sageman and Geary are in a position to assume full responsibility.

Mr. J. G. Evans, the electrical representative of Semco Electrical & Cycle Dealers, Georgetown, British Guiana, is in this country until the end of June. Readers can get into touch with him c/o W. H. Jones & Co. (London), Ltd., Barnet, Herts.

Mr. George Ainsworth Wates, B.A., has been appointed to the board of Johnson & Phillips, Ltd. Mr. Wates is a solicitor and a partner in the firm J. D. Langton & Passmore. He is the eldest son of Mr. G. Leslie Wates, chairman and joint managing director of Johnson & Phillips, Ltd. Mr. G. A. Wates was educated at Mill Hill School and Trinity Hall, Cambridge, obtaining a B.A. honours degree in mathematics and law in 1935. He was admitted a solicitor in 1938. During the last war he served with the Royal Artillery, attaining the rank of major, and at the end of hostilities served twelve months with the Legal Division of the Military Government in Germany. He was attached to the Eighth Corps Headquarters, being in charge of the internal discipline of the defeated German Army interned in Schleswig-Holstein, and he subsequently acted as a magistrate in the Military Government Courts, and supervised the administration both of these Courts and of the German Courts.

The Transport and Packaging Departments of the General Electric Co., Ltd., have now been combined in one department of which **Mr. E. G. O. Ridgwell,** formerly the company's packaging controller, is appointed manager. Mr. Ridgwell, who was recently chairman of the Southern Area of the Institute of Packaging, joined the G.E.C. in 1946, and early in 1948 was appointed to deal with the packaging problems of the company. In April, 1950, he was appointed packaging controller, a new position in the company. Mr. Ridgwell represented B.E.A.M.A. on the specialist packaging team sent to America in 1949 under the sponsorship of the Anglo-American Council on Productivity. He also represented B.E.A.M.A. on the various committees which recently revised B.S. 1133, "The Packaging Code," and on the Packaging Sub-Committee of the Overseas Policy Committee of the F.B.I.

Mr. E. G. O. Ridgwell

The National Coal Board has appointed **Dr. L. C. Tyte** to be Director of the second Central Research Establishment at Isleworth, Middlesex, which is engaged on investigations

of the underground problems of the industry. Dr. Tyte will be responsible to the Director General of Research, Dr. W. Idris Jones, at headquarters.

The English Electric Co., Ltd., announces that **Viscount Caldecote,** D.S.C., M.A., Fellow of King's College, Cambridge, and Second Bursar; associate member of the Institution of Naval Architects, and of the North East Coast Institution of Engineers and Shipbuilders; and a United Kingdom representative of the Administrative and Budgetary Committee of the General Assembly of the United Nations (1952), has been elected a director of the company.

Mr. Edward Satchwell Cornwall has been appointed general manager and chief engineer of the Southern Electric Authority of Queensland. This Authority was established by the Southern Electric Authority of Queensland Act, 1952, as the successor to City Electric Light Co., Ltd., with unbroken continuity of control and management. Mr. Cornwall is its first general manager and chief engineer.

The marriage of **Mr. Sebastian Z. de Ferranti,** elder son of Sir Vincent and Lady de Ferranti, and Miss Mona Helen Cunningham, only daughter of Mr. and Mrs. T. E. Cunningham, of Sunninglale, Berkshire, took place at the Church of St. Mary, Cadogan Gardens, London, S.W.3, on 9th April. Father Peter Uttley, O.S.B. (the bridegroom's former housemaster at Ampleforth College), performed the ceremony. The best man was the bridegroom's brother, Mr. Basil Z. de Ferranti. Members of the Cheshire Yeomanry, in which regiment the bridegroom holds a commission, formed a guard of honour. The reception was held at the Hyde Park Hotel, and the honeymoon is being spent on the Continent.

Mr. and Mrs. Sebastian Z. de Ferranti leaving the Church of St. Mary, Cadogan Gardens, S.W.3, after their marriage

We reported in our last issue that **Mr. A. H. Carmichael,** director of the Brass and Copper Tube Association for the past sixteen years, had been appointed director of the Cable Makers' Association. We now reproduce a portrait of Mr. Carmichael.

Mr. A. H. Carmichael

At the invitation of Alderman Walter S. Lewis, C.B.E., J.P., chairman of the Midlands Electricity Board, the Lord Mayor and Lady Mayoress of Birmingham (Alderman and Mrs. W. T. Bowen) paid a visit on 10th April to the headquarters of the Board at Mucklows Hill, Halesowen, and afterwards went on to Stourport "B" power station, where they were received by Mr. R. L. Batley, O.B.E., recently appointed Controller of the B.E.A. Midlands Division.

Mr. W. C. Kennett, M.I.E.E., was married on 11th April at Banstead Parish Church to Joan Mary de Winton, S.R.N.

Mr. R. S. Atkinson has been appointed chief generation engineer (operation) for the Merseyside and North Wales Division of the British Electricity Authority. For the past two years he has been generation engineer (operation) for the London Division. Mr. Atkinson succeeds **Mr. R. L. Batley** who is now controller of the Midlands Division.

Mr. James Walker, chairman of the Electricity Board for Northern Ireland, has been appointed a member of the Ulster Transport Authority.

A call for the co-operation of every section of the industry in combating the "raw deal" which the electrical industry had received since the beginning of the last war was made by Mr. W. T. Trace, president of the **Electrical Contractors' Association** and Allied Associations, at the annual dinner and dance of the Plymouth Branch at the Duke of Cornwall Hotel on 1st April. He defined the raw deal as shortage of material and manpower, lack of new generating stations, lack of fuel, and the unfair competition and propaganda of the gas and solid fuel industries. He said they would have it believed that it was almost a crime to use electricity for anything but lighting. The industry must not be deterred, however.

The dinner was attended by the Lord Mayor

and Lady Mayoress of Plymouth, Alderman H. E. and Mrs. Wright. Mr. H. M. Pattinson, chairman of the Plymouth Housing Committee, said that his Committee, against some opposition from the South Western Electricity Board, had entrusted the electrical maintenance of about 7,000 Corporation houses to private electrical contractors. The district manager of the South Western Electricity Board, Mr. N. Axford, said that the private contractors and the Area Boards were complementary, even though they were competitors. The dinner was presided over by the branch chairman, Mr. E. R. Gardiner.

The Dramatic Section of the **Johnson & Phillips Social Club** staged three performances of Michael Pertwee's "Night was our Friend," last week. The play, a psychological drama of intrigue, suspense and suicide, was given before packed houses in the Club's Hall at Charlton. It was the twelth production, and among the audience were Mr. G. Leslie Wates, chairman and managing director of Johnson & Phillips, and Mr. R. W. C. Reeves, a director.

The final of the **Cable Makers' Association Football Cup Competition** between British Insulated Callender's Cables, Ltd., Prescot, and Southern United Telephone Cables, Ltd., was played on the ground of the Telcon Sports Club on 11th April, when Southern United Telephone Cables won by four goals to nil. The Telegraph Construction & Maintenance Co., Ltd., and the Telcon Sports Club made arrangements for the comfort and entertainment of their guests, and Callender's Senior Band provided a musical programme. The chairman of the Cable Makers' Association, Mr. F. Waine, and many representatives of C.M.A. companies and their ladies, were present.

After the match the twenty teams which had taken part in the competition were entertained to dinner at the Holborn Restaurant under the chairmanship of Mr. E. C. Griffiths, who has been chairman of the Competition since its inception in 1924. Mr. E. C. Holroyde (immediate past-chairman, C.M.A.) presented the cup to the winners and medals to the two teams, the referee, Mr. J. W. Hartnett, and linesmen.

OBITUARY

Mr. A. A. Goldstone.—The death occurred on 12th April, at the age of seventy-two years, of Mr. Albert Alexander Goldstone, chairman and one of the founders of Ward & Goldstone, Ltd.

Mr. James Wilson, O.B.E., former president and chairman of the executive committee of the Shawinigan Water & Power Co. and head of a group of companies in Canada, the United States and the United Kingdom, died on 22nd March in Montreal. He was seventy-eight and had retired at the end of 1950.

WILLS

Major V. B. Douglas-Cooper, O.B.E., R.E., M.Inst.C.E., M.I.E.E., who was responsible for the construction of a number of the early municipal electric tramway and railway systems, and who died on 17th November last, left £3,204 gross (£2,992 net).

Mr. R. W. Wickham, formerly chairman of the Mid-Cumberland Electricity Co., Ltd., Penrith Electric Supply Co., Ltd., Settle and District Electricity Co., Ltd., and other companies, who died on 4th December last, left £69,161 gross (£62,642 net).

Sir William C. Dampier, Sc.D., F.R.S., senior Fellow of Trinity College, Cambridge, secretary of the Agricultural Research Council from 1931-35, and author of "Theory of Experimental Electricity," etc., who died on 11th December last, left £85,372 gross (£84,379 net).

Mr. R. G. Kilburne, O.B.E., M.I.E.E., chief engineer to the Government of Nepal since 1926, who died on 9th December last, left estate in Great Britain valued at £8,745 gross (£7,288 net).

Mr. L. Freeman, founder of the Freeman Electrical Co. (London), Ltd., who died on 20th June last, left £4,975 gross (£2,898 net).

The Budget

ON Tuesday last the Chancellor of the Exchequer, Mr. Butler, presented what he called his "Incentive Budget." After reviewing the past year's finances and the trade situation he said that he proposed no new taxes; on the contrary there would be a number of reductions.

Among these he announced a reduction of 6d in the £ off all rates of income tax, with certain increases in allowances for elderly people. There would be an all-round reduction in purchase tax of one-quarter of each of the rates in the general field. Radio set batteries would be exempted from the tax. The reduction from 66⅔ to 50 per cent would include motor cars, radio and television sets, refrigerators, vacuum cleaners and washing machines. He hoped to come to the rescue of electric goods vehicles by exempting them from the 33⅓ per cent tax on their chassis.

The excess profits levy would be ended with effect from 1st January, 1954. He proposed to restore the system of initial allowances for industrial capital expenditure. The rates would be 20 per cent for plant and machinery, 10 per cent for industrial buildings and 40 per cent for mining works. The system would operate over profits tax as well as income tax.

Scientific Instruments

Thirty-seventh Physical Society Exhibition

THE thirty-seventh annual exhibition of scientific instruments and associated apparatus organized by the Physical Society was opened on Monday last (13th April) at the Imperial College, Imperial Institute Road, South Kensington, London. It will remain open until 5 p.m. to-day (Friday).

Altogether, there are 134 exhibitors this year, which is eight fewer than there were last year, and this has facilitated a return to the original practice of accommodating all of the stands within the one building. Although the number of visitors has been large this has proved to be a more convenient arrangement and there has been no undue overcrowding.

As is well known, the primary purpose of Physical Society exhibitions is to indicate advances in design and demonstrate the application of new techniques to old problems. Without a doubt, this year's display illustrates the pre-eminence of British engineers in the scientific instrument field. The wide diversity of items shown by manufacturers, together with the demonstrations by research organizations and the universities, emphasizes the importance of applying physical principles to the solution of engineering problems.

Discourses on Research

In accordance with past practice three discourses have been delivered in the large chemistry theatre during the period of the exhibition. On Tuesday evening Dr. E. C. Bullard (National Physical Laboratory) dealt with the seismic study of ocean basins and described the instruments and techniques of measurement that were employed. On the following evening Dr. L. A. Jordan (Paint Research Station) demonstrated the importance of physical considerations in research work applied to paint technology and on Thursday evening Prof. W. V. Mayneord (Department of Physics, Royal Cancer Hospital) spoke on scintillation counting and its medical applications.

The prize-giving in connection with the annual Craftsmanship and Draughtsmanship Competition took place on the opening day of the exhibition. The entries are on view on the landings of the first and second floors of the College and it is good to see that the high standard of skill shown by previous entrants is being maintained.

Preponderance of Electronic Equipment

Of course, the major proportion of the exhibits are "electronic" and this is not surprising when it is remembered that of the total number of valves, capacitors, resistors, transformers and allied components which are made in this country only 25 per cent of them are used in the manufacture of domestic radio and television receivers. At one time the engineer tended to consider that valves and the like were unreliable but judging by the exhibits on view this week, which include apparatus for use in almost every conceivable industry, this attitude has changed. Indeed, many of the functions performed either by or with the aid of electronic equipment would be impossible in any other way.

The oscilloscope is now an indispensable tool to all research workers and many instruments of this type are on view, most of them being for special purposes. Some are very small and extremely portable while others are of a more static nature. In all cases the design is such as to provide the maximum possible flexibility in use without resort to external attachments, but these are available for use in special cases. External appearance, too, has received a great deal of attention. Indeed, there is evidence throughout the exhibition that the scientific instrument industry as a whole considers it worth while to spend time, after having designed a piece of equipment, to produce it in a form which is pleasing to the eye.

Next to the oscilloscope the amplifier is perhaps the most generally useful piece of electronic equipment and many different types are on view, ranging from those for operation on low and audio frequencies

to wide-band high frequency amplifiers. Magnetic amplifiers have now become quite common and they are used wherever an extremely high order of amplification is required and time-lag is of negligible importance. Where time-lag would be undesirable electronic amplifiers are used but they are more difficult to design. However, several interesting examples are on view.

Apart from their obvious use in the field of measurement amplifiers find considerable use in process control gear in industry and in servomechanisms of all kinds. In this connection many other exhibits are displayed. There are pick-up and sensing devices including strain gauges, thermocouples and photocells, small electrical rotating machines, many of which are of ingenious design, and equipment on which the behaviour of servomechanisms is either studied or a control system to perform some particular function can be planned. Here we can see how modern methods permit more efficient production in many different industries.

Control System Components

Several firms have various component parts for control systems on view which have been specially developed for use in military aircraft, guided missiles, etc. Here an extremely high degree of " miniaturization " has been achieved and by making use of new magnetic and insulating materials combined with a new approach from the production angle it has been possible to make equipment which will operate satisfactorily under extreme climatic conditions.

Industrial control systems are, however, also fairly well represented and among the items there is a precision equipment for controlling humidity, several for controlling temperature and many frequency, current and voltage controllers.

In the high frequency sphere there are demonstrations of some of the many techniques of measurement which are constantly being developed. Radiation monitoring apparatus, too, can be seen on a large number of stands.

As would be expected, indicating instruments of all types are being shown. There seems to be a tendency these days to produce rectangular rather than circular panel mounting instruments and in many cases a means of illuminating the scale is provided either from within the case of the meter or externally. A large number of very small panel mounting meters are now available with all the usual ranges for incorporation in electrical equipment which in these days it seems must occupy the absolute minimum of space. This has probably arisen on account of the needs of the aircraft industry and the Services, but it does not seem undesirable in industry if the same degree of reliability can be obtained as with much bulkier apparatus.

Materials Handling and Processing

ON 15th April Mr. L. Landon Goodman, B.Sc., A.M.I.Mech.E., A.M.I.E.E., of the British Electrical Development Association, presented a paper " Materials Handling and Processing—Past and Present " to the Royal Society of Arts. The paper sets forth an approach to production matters by dividing all major industrial operations into two classes, namely, materials handling and materials processing, which are considered as two separate but closely related technologies. The author stresses that all industrial establishments can increase their productivity if they adopt this new way of thinking.

Mr. Goodman says:—" The first public demonstration of the transmission of electrical energy took place in 1873. This was the forerunner of the great surge forward which occurred with the advent of electrical power in layout, processing and handling. Shortly afterwards F. W. Taylor was experimenting with individual electric motor drives of machines from the work study and layout aspects." After reading this it is a little disappointing not to see the importance of the electric drive and control more fully stressed in a very interesting survey of all manner of handling equipment, including overhead runways, cranes, lifts, conveyors, elevators and trucks.

N.Z. Vacuum Cleaner Tariff

THE New Zealand Board of Trade proposes to inquire into and report upon the rates of import duty on vacuum cleaners. At present British cleaners are allowed in free of duty under the preferential tariff; other countries' products bear duties of 20 or 25 per cent, the latter rate being subject to a surtax. Statements of evidence have to be lodged by 14th July with the Secretary of the N.Z. Board of Trade, G.P.O. Box 2424, Wellington, C.1. Notes for the guidance of witnesses in preparing evidence can be obtained from the Commercial Relations and Exports Dept., Board of Trade, Room 6150, Horse Guards Avenue, London, S.W.1 (telephone: Trafalgar 8855, extension 2420.)

ELECTRICAL RESEARCH

Annual Meeting and Luncheon

THE annual luncheon of the British Electrical and Allied Industries Research Association took place at the Connaught Rooms in London on 10th April. It was preceded by the annual general meeting of the Association, purely formal, and followed by a meeting of the Council. The constitution of the latter remains the same as last year; no new members were elected though co-opted members have been confirmed in office while Mr. C. T. Melling, representing the Area Boards, has become chairman of the Council in place of Mr. H. Astbury, a B.E.A.M.A. representative, whose term of chairmanship has terminated so happily with the bringing of the new Leatherhead establishment project so far forward as to permit hope of an announcement on the subject very shortly.

THE LUNCHEON

Sir David Brunt (secretary, Royal Society) seemed puzzled why he, a meteorologist, should have been asked to propose the toast of the E.R.A. He could think of less risky, though not easy, ways of making money grants than those which tended to enable young men to live on their grants instead of using them to try out their own ideas. Some things that meteorologists did could be of value to engineers; it was he who, for instance, had first suggested that $2\frac{1}{2}$ times the height of the building would be a sufficient criterion of power station chimneys. He thought highly of the way the E.R.A. had worked out the survey of wind power for electricity generation and in sixty years there had been nothing like the E.R.A. electrical anemometer.

Sir John Hacking, responding, first expressed his thanks for the honour done him by electing him president. He had had happy associations with Sir David over quite a number of years and appreciated very much the work he had done as a meteorologist in connection with the emission of gases from chimney stacks; they owed it to him for having codified the principles which determined the dissemination of gases from power stations and there was no doubt that the figure of $2\frac{1}{2}$ in itself went a long way towards reducing any serious nuisance providing it was coupled with a reasonable cleaning of the gases before they were emitted. Many people who opposed proposals for the construction of generating stations on particular sites would not agree with him, but he thought that that was because they refused to face up to the undoubted facts which Sir David had quite fully established.

He had been interested in Sir David's remarks about entrusting research work to the "right" people, but he must say that he thought Sir David had perhaps overestimated the value of what he described as the "by-products" of research and hoped that the scientist to whom they entrusted research with a special object in view would not take his eye off the ball too readily!

It was the intense research which was needed for the particular application of nuclear energy to destructive purposes that promoted the rapid growth of knowledge of the subject, and brought within practical possibility the likelihood of putting up stations for nuclear electricity generation.

Sir David was also the chairman of the Research Council of the electricity supply industry which in Sir John's view was doing a first-class job. Its function was largely advisory and he paid tribute to the great service which that Research Council had already rendered in the affairs of the electricity supply industry.

Sir John then turned to the Electrical Research Association itself. Its appeal was fully justified and approximately 20 per cent increase was actually achieved, which meant that the D.S.I.R. grant continued at the level it was at the end of the quinquennial period, and there had been a substantial increase of the funds available to the Association to carry out much new research work. The total revenue which the Association now had was some £270,000 a year, which was over 50 per cent greater than that in 1947. It must be remembered, however, that this increase was offset very largely by the decline in the value of money; in fact it had only been by greater

efficiency that it had been possible to undertake any additional research.

The question of measuring the value of research was a very difficult one. Although he deplored it, the only practicable yardstick which seemed to have come forward was the amount of money spent on research.

The total income of the Association was contributed as to one-third by the supply industry, as to only slightly less than half by the D.S.I.R. and as to rather less than one-quarter by the manufacturers. The supply industry, which was the B.E.A. and the Area Boards, had substantially increased its contribution in comparison with that before vesting date, as well as taking part in the general 20 per cent increase, and he felt sure that the Area Boards would, as time went on, be willing to increase their contribution on a substantial scale. In addition to that, the supply industry was spending upward of £500,000 on its own research.

The manufacturers were contributing something of the order of a quarter of the Association's funds. It was a pertinent question for them to ask themselves, as the B.E.A. had asked itself several times, whether theirs was an adequate contribution. It was not worth while considering their contributions in relation to their own direct costs of research. The manufacturers of plant, plus cables, were spending something of the order of not less than £7,000,000 a year on research. Their contribution to the Association was not more than 1 per cent of that which they were contributing directly to their own research. There was room for reconsideration of that and for justification of greater support of the central Association.

THE E.R.A. REPORT

The report for the year 1952 is illustrative of the range of subjects with which the Association has to deal; so wide is it as to need substantial expenditure, but the coming into operation of the new terms of grant from the Department of Scientific and Industrial Research faced the E.R.A. with yet another of the many obstacles it has had to surmount. The response to the consequent appeal, which stated that a 20 per cent immediate increase in industrial income was hoped for with subsequent increases to enable the maximum grant to be earned, has been so gratifyingly generous that not only has the D.S.I.R. grant been maintained but slightly increased so that the total income has exceeded £250,000. Expenses have increased also, yet members' generosity encourages confidence in the future.

The main changes so far instituted will make financial control more effective and at the same time impart more elasticity and corresponding efficiency to the prosecution of research. As a result the present report covers a period of fifteen months from 1st October, 1951, to 31st December, 1952; subsequent reports and accounts will revert to a yearly period to coincide with the calendar year.

The 25th anniversary of the gas-blast and the 21st of the baffle side-blast switchgear inventions of Dr. W. B. Whitney and Mr. E. B. Wedmore have so far been marked by lectures on the history of circuit breaker research. Further foreign licences have been negotiated on patents still in force abroad. Work on the air-break arc-chute type a.c. circuit breaker has led to a new design of chute for higher powers and voltages. There has been progress in multiple break switches for high voltages. The performance of a.c. fuses on small overcurrents has been studied and contactor studies have been made up to 1,200 A 3-phase at 440 V. The E.R.A., in addition to its work at Perivale, has equipped with staff the flameproof and intrinsic safety investigations at S.M.R.E. and extensive new facilities there have provided for tests on running motors.

Interest in cable short-circuit ratings now lies in the behaviour of joints, and methods have been developed for the quantitative assessment of this limitation. Ratings for the cyclic loading of cables laid direct have been computed and new facts have emerged on the continuous and cyclic ratings of cables in ducts. Part II of the handbook on overhead lines in unbalanced conditions has been issued and Part III on corona and voltage regulation will soon appear, together with concise instructions for the characteristics most frequently encountered. Reports have been issued on corrosion of insulators and fittings and on the bond strength of galvanized iron members in concrete.

The main investigation of mechanical forces in tapped transformer windings is complete. Other studies include temperature distribution, losses in modern designs, the origin of transformer noise and the

design of capacitor bushings. A new magneto-optical method of measuring currents in v.h.v. systems has been shown to be theoretically sound.

Studies with the E.R.A. model d.c. transmission link simulating h.v. operation are virtually complete and a series of patents has been taken out. On the full-scale trial scheme a specific proposal has emerged relating to the cross-Channel power link and is being considered.

Operational research on fire risks in co-operation with the Joint Fire Research Organization and the Home Office bears particularly on the vulnerability of old electrical installations. Codes of practice and official recommendations on earthing are being elaborated. Commercial production is being arranged of the E.R.A. dispersion meter which measures absolutely moisture in insulation.

In generation, the most important problem is to raise the working pressure and temperature of steam turbines. Professor D. M. Newitt has made considerable progress with equipment for measuring the properties of steam up to 6,000 lb/sq in and 1,400 deg F and hopes the apparatus will be ready this year.

The survey of potential wind power in the British Isles has been extended to the Shetlands, Isle of Man, east coast of England and further sites in Scotland and Ireland, making a total of more than 70 sites, most of which are suitable for generators. The Orkney generator has been operated, but is not yet in full commission.

The new team for research on the gas cell is complete and new cells and auxiliary studies are in hand. Note has been taken of the situation regarding other fuel cells, primary and secondary batteries and also thermo-electric generators.

The success attending the Association's recommendations on grass and grain drying has encouraged the extension of research on drying to multi-purpose farm drying, moisture equilibria and measurement and seed drying. Electric weed killing and singeing seems rather promising, as is also true of the electrical operation of static and mobile agricultural machinery. Very encouraging results have been obtained from the flash illumination of laying poultry. There is interest in applying the heat pump principle to combined milk-cooling and water-heating, while growing interest in floor heating has made possible the study of practical installations and a realistic assessment of its advantages. Work is being extended on airing and drying. Some success has been achieved on a laboratory scale with methods of thermal storage to provide a constant temperature heat store with portability where needed.

Some 94 reports have been issued to members and 76 already issued have been published. An increasing number, already very great, of technical inquiries have to be answered. Loans of periodicals and books continue to increase; substantial accessions to the library have been made.

The total staff of 294 remains approximately the same, but salary and wage increases have raised this expense by more than 10 per cent. Several promising lines of advance have been halted by staff shortage which has also caused a falling-off in the number of completed reports.

Canadian Graduates

THE Athlone Fellowship Scheme for two years' practical training in Great Britain of thirty-eight Canadian engineering graduates was the subject of a paper presented by Dr. W. Abbott (Ministry of Education) on 10th April at a joint meeting of the Institutions of Civil, Mechanical and Electrical Engineers. The training period may be spent in industry and or in a university. In considering the background of the scheme, now in its third year, Dr. Abbott pointed out that the dollar ratio of exports from and to Canada in relation to Great Britain was 3 to 2, compared with nearly 2·4 to 3 for the United States.

Requirements of consumer goods for Canada's population of 14 million were likely to be limited, but the demand for capital goods during the next half century might be very great. The electric power available (mainly hydro-electric) equalled that in Britain with about four times the population.

The fundamental aim of the scheme was to familiarize Canadian graduates with British industry, but a majority preferred university studies with a view to securing higher degrees, which were necessary for research appointments and had a definite market value in N. America. The single factor that militated most against the scheme's success was the great demand for graduates in Canada and the United States, where high starting salaries were paid. In conclusion the author raised the question of whether the purpose of the Athlone Fellowship Scheme would be achieved if the present preference for a university course over an industrial one were to continue.

VIEWS on the NEWS

By REFLECTOR

WITH its April issue the *Electrical Contractor and Retailer* completes its first 50 years and I am glad to see that several of the old E.C.A. stalwarts (including the first president, Mr. W. R. Rawlings) have been able to contribute their reminiscences of the Association's early days. I confess to a liking for the sort of " harking back " which is an essential of these occasions, although too often I re-discover that " sorrow's crown of sorrow is remembering happier things." (The *Contractor* reminds us that in 1903 whisky was 36s a *dozen*.) It is fitting that a tribute should be paid to the energy and versatility of the first editor, the late Mr. Howard Marryat, whose son, Mr. Robert Marryat, contributes to the issue, and to Mr. R. W. Kennedy who edited the journal for about 25 years.

* * *

Alchemy is a practically-abandoned pursuit but it has a modern (and more successful) counterpart in the production of synthetic precious stones. The General Electric Co. of America produces sapphires, rubies and rutile crystals, says *Aluminium News*, by means of an electronically-controlled automatic furnace. In the process a stream of fine alumina powder (aluminium oxide) falls through an oxy-hydrogen flame on to the top of the rod of synthetic ruby, which grows upward in a single crystal. It is not considered that alumina producers will be lured away from their normal pursuits by the exciting possibility of selling jewels: there is still a pretty good demand for aluminium products. By the way, the production of synthetic stones is not unknown in this country.

* * *

It has sometimes been complained that there is a lack of variety in the finish of refrigerators—most of them are in white enamel. In *Modern Refrigeration* for March there was a note about a new scheme by an American company which should get over all such complaints. The door of this company's refrigerator has a removable moulding round its sides. This can be removed and the housewife can stretch across the door any kind of fabric she likes, seal it with adhesive tape, trim the edges and replace the moulding.

* * *

Meter cards have cropped up again. The Shrewsbury Housewives' Association is reported to be up in arms because the Midlands Electricity Board has declined to make a general restoration of meter cards. The Board has, however, offered to supply cards to those who ask for them which seems to me to be fair enough. I would therefore beseech the Shrewsbury ladies not to worry their M.P. on the matter as they are contemplating doing.

* * *

Cautionary tale by " Uncle John " in the *Salford City Reporter*:—

" Dear Boys and Girls: Are you scared of electricity? It is dangerous of course to touch any electrical fitments if you do not know much about this subject, for electricity is a funny thing and can not only give you a nasty shock but can, as you know, kill you. So always be very careful."

After this introductory exhortation there follows a simple chat on volts and watts.

Electrical Manufacturing in 1952

Trends Indicated by B.E.A.M.A. Report

IN the face of many handicaps the British electrical manufacturing industry continues to advance and last year again became the second largest exporting industry as well as meeting home demands. The report of the Council of the British Electrical and Allied Manufacturers' Association for 1952 is a record of intense activity in many directions.

Among the handicaps specifically mentioned, those affecting the domestic appliance side have been most serious—ministerial regulations, import restrictions abroad and the state of the country's economy. On the industrial side heavy taxation has prevented manufacturing concerns from making adequate provision from profits for working capital and reserves to maintain enterprise.

Generating Plant Programme

To ensure economic recovery it is considered to be an "inescapable necessity" that the plant programme of the British Electricity Authority should progress from year to year from the 1,540 MW addition made in 1952 to some 2,000 MW. Altogether the turbine manufacturers had an output of 2,042 kW, nearly 15 per cent more than in 1951, and there is every prospect that this figure will be exceeded this year. Through the Heavy Electrical Plant Consultative Council, the B.E.A. and B.E.A.M.A. have urged the Minister of Supply to amend his "directive" giving priority to potential overseas orders for plant; it was stressed that the manufacturers were able to meet both home and export demands without interfering with the B.E.A. programme. The monthly meetings of the B.E.A. Co-ordination Committee have contributed to the commissioning of a record amount of generating plant by drawing attention to bottlenecks and indicating measures for eliminating them.

The Council pays special tribute to the work of the Standardization Committee and the Technical Committees which has enabled the industry to continue to expand on methodical lines.

Reference is made to the substantial easement in the overall material supply position during the past few months which has been accompanied by the removal of restrictions. Copper remains dear and controls on the uses of nickel are hampering domestic appliance manufacturers in their efforts to increase export trade. Arc-welding electrode makers have received increased quantities of core-wire but are still faced with shortage of supplies and widely-differing prices. New restrictions on the use of alloy steels were welcomed as helping to bring about a better balance between the allocations of carbon and alloy steel.

A brief account is given of the E.D.A. Industrial Productivity Conference last October at which Col. B. H. Leeson, director of B.E.A.M.A., presented a paper. The contribution which the B.E.A.M.A. Catalogue (second edition) is making to the industry's export drive is mentioned and it is stated that of the 16,000 copies printed 15,000 have been sent to people nominated by the Association.

It is noted that the Ridley Committee endorsed the electrical industry's opinion that the consumer should be the final arbiter in the choice of fuels available to him for particular purposes and thus provide the stimulus that competition gives to improving efficiency.

Purchase Tax Representations

The unfair discrimination against electrical appliances in the matter of purchase tax is again stressed. As in past years, representations have been made to the Chancellor of the Exchequer, in advance of this year's Budget, seeking favourable consideration of the electrical point of view. Under the present arrangements certain products are being "taxed off the market," and it is difficult for manufacturers to produce economically for home needs and to meet foreign competition overseas.

Evidence has been given by the Association before the Purchase Tax (Valuation) Committee set up to inquire into the present method of assessing tax on a common value level. Sales of domestic appliances have also been materially reduced by the hire-purchase restrictions and it is hoped that steps taken to secure some relaxation will be successful.

After a short review of the proceedings at last year's British Electrical Power Convention, the Council says that it has been agreed that the B.E.A.M.A. representation at this year's Convention at Torquay shall be increased from 200 to 250.

With regard to the second Electrical Engineers' Exhibition which was remarkably successful, it is said that plans for the future of this exhibition are under consideration. References are also made to the forthcoming Engineering, Marine and Welding Exhibition, in which the Association and individual members are participating, the British Industries Fair, the 1954 World Power Conference and other international gatherings.

Electrical Appliance Design

The Association is supporting the E.D.A./B.S.I. Advisory Committee on Electrical Appliances and Accessories and it is claimed that the work of this Committee since 1947 has confirmed that the vast majority of British-made electrical appliances and accessories are entirely satisfactory and absolutely safe. The B.E.A.M.A. is behind the Committee in its efforts to eliminate unsatisfactory designs.

During the year two further issues of "Public Transport Information" were produced, containing comparisons of operating costs of fuel-oil and electrically-driven vehicles. It was shown that in contrast with the trend in this country overseas electric passenger transport services had greatly expanded since the war. The need for a more farsighted policy was urged on transport operators. The attention of the Trolleybus Committee is being given to the need for providing more facilities for education in electric traction engineering.

Co-operation has continued between the Association and the British Engineers' Association in such matters as training and education and opposition to certain provisions of the Iron and Steel Bill.

The work of the Association of Short-Circuit Testing Authorities is touched upon and brief reference is made to co-operation with many other electrical and allied organizations.

In the section of the report covering export activities it is noted that the total of £218 million of direct electrical exports in 1952 was 15 per cent over the preceding year's total. The expansion was largely due to increased exports of machinery and wires and cables. Although there was an overall increase in the value of exported electrical appliances, accessories and other equipment, such important exports as vacuum cleaners and washing machines suffered serious reductions, largely because of Australian import restrictions. The expansion of the Canadian market was well held, Canada being the second largest buyer of generating plant after Australia.

Overseas Competition

Referring to incentives provided by their Governments to German and other Continental competitors, the report says that B.E.A.M.A. has joined with the F.B.I. in representations to the Government urging that action should be taken to abolish all forms of export subsidies and incentives. The Government is also being pressed to extend the facilities of the Foreign Exchange Control Department and the Export Credit Guarantees Department to enable manufacturers to quote longer-term credits when necessary and pressure is being brought to bear upon the E.C.G.D. to provide cover to enable manufacturers to offer firm prices.

The formation of the Electrical Industry Export Service, with its "Electrical Industry Export Bulletin," is recorded and it is stressed that the Service is available both to members of B.E.A.M.A. and non-members.

Increasing activities by the Overseas Committees is reported. Membership of these Committees is open to any local representatives whose interests do not conflict with the interests of British trade.

Also mentioned in the export section are collaboration with British consulting engineers, an appeal for the provision of British equipment to Beirut University, the lack of British representation on field missions sponsored by the International Bank for Reconstruction and Development, the Schuman Plan, the Economic Commission for Asia and the Far East, Australian import restrictions, New Zealand import licensing, Dominion tariff board inquiries

and German and Japanese competition. In a section dealing with the work of the Council Committees special reference is made to the F.B.I. scholarship scheme for South American students and to steps being taken to increase higher technological education facilities. The activities of the new Electricity Development Committee are outlined. In the report of the Materials Committee reference is made to the continuation until the end of February last of the relaxation of the duty on imported large h.v. porcelain bushings. The running down of stocks of materials may result in temporary difficulty in obtaining supplies and members are advised to co-operate with suppliers by scheduling their requirements as far ahead as possible.

In dealing with the electrical machinery inquiry now being conducted by the Monopolies Commission, the Council points out the enormous expenditure of time, work and money in which this involves the industry.

Brief indications are given of the work during 1952 of the 25 Sections of the Association and the 23 Technical Committees.

Supervising Engineers

THE annual dinner of the Association of Supervising Engineers was held on 10th April, with Mr. C. T. Melling (president) in the chair. Proposing the toast of "The Electrical Industry," Sir David Brunt (chairman, Electricity Supply Research Council) mentioned that his first professional connection with the industry was in 1931 when his opinion was sought as to whether the operation of Battersea "B" power station with chimneys more than 300ft tall would be likely to injure the health of the legislators at Westminster. His reply had been in the negative.

Research, he believed, would provide many legitimate "jobs for the boys" and he instanced the present defects of cooling towers. Although he held that atomic energy would be available to some extent for generating electricity within a few years, he felt certain that no one need have any uneasiness about its effect on his position. The present age, he suggested, was the age not of atomic energy but of domination by committees—a great menace, since they usually wasted more time than they could save.

Responding, Mr. T. G. N. Haldane (immediate past-president, A.S.E.E.) expressed the view that the electrical industry was well below saturation point in supply, installation and manufacture, since output tended to be doubled each decade. It was too early yet for a dispassionate assessment of public in relation to private ownership, but by following the British tradition of trial and error the interests of the individual and the nation would no doubt be harmonized. He agreed that it was necessary to get rid of the excess of committees and departmental orders.

A defect in the industry had been its failure to cater for the large body of technicians which came between professional engineers and craftsmen. The Association, which was supported by the Institution of Electrical Engineers, was particularly capable of dealing with this need within the extended range of its activities, especially in regard to utilization.

The chairman proposed "Our Guests" in a speech which contained numerous witty allusions to the distinguished personalities present, who represented the many-sided connection of the Association with other professions. Mr. Melling stated that he had been informed by the secretary, Mr. E. A. Bromfield, that more than 600 members and guests were present at the function—easily the largest attendance yet recorded.

In response, Mr. T. E. Goldup (director, Mullard, Ltd.) further emphasized the need for an adequate supply of technicians of enhanced status. There was no more important activity of the Association than that of looking after apprentices.

The speeches were interspersed with musical and other entertainment and were followed by an informal reunion.

Preserving Wood Poles

The illustrations used in the article bearing this title in our issue of 3rd April should have been marked "Crown copyright."

NEW BOOKS

Photometry. By John W. T. Walsh. Second edition. Pp. 544; figs. 281; index. Constable & Co., Ltd., 12, Orange Street, London, W.C.2. Price 63s.

For more than a quarter of a century this book has been the bible for those engaged in the measurement of light not only in this country but in many other parts of the world. Much has happened in the field of photometry since 1926 and the progress that has been made is recorded faithfully and well in the new edition. The chapters largely follow the arrangement of the 1926 edition but an examination of each of them reveals a most detailed revision which has involved elimination of matter which has become obsolete or unimportant and the inclusion of new material culled at first hand from original papers.

As in the first edition the references at the end of each chapter are encyclopædic and in comparing the two editions one can trace in each aspect the progress and change which has occurred in the science of photometry. Although the preface to the new edition is dated August, 1949, Dr. Walsh has included the latest nomenclature for photometric terms agreed in the C.I.E. both in 1948 and in 1951. The new chapter on " Photo-electric Cells " following the one on " The Eye and Vision " appropriately puts in perspective the important new techniques resulting from the evolution of stable photo-electric cells of many kinds.

The original chapter entitled " The Measurement of Colour," now much enlarged, bears the title " Colorimetry " and includes among other things a most interesting study of colorimetric techniques and photo-electric and other colorimeters. Chapters XII and XIII, dealing with " Illumination and Luminance " and with the " Measurement of Reflection, Transmission and Absorption Factors," are likely to have a particular appeal to the illuminating engineer.

Dr. Walsh's friends, and they are many, have learned to expect a great deal from him and it is fitting that at the conclusion of his long and distinguished career at the National Physical Laboratory he should have been enabled to produce a new edition of the book which made him famous. No illuminating engineer should be without this new edition. It should be on the shelves of university libraries, physicist and industrial and other laboratories. The production is excellent, the illustrations clear and the index comprehensive.—J.N.A.

Electrical Units. By Eric Bradshaw, M.B.E., M.Sc.Tech., Ph.D., M.I.E.E. Pp. 64; figs. 9. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 9s 6d.

With the increasing use of M.K.S. units in electrical engineering it is essential that students and engineers should become familiar with these units and their relation to the C.G.S. system. This book aims to describe, as concisely as possible, the principal systems of units and in particular the rationalized M.K.S. system. The author compares this with the unrationalized system and shows that the former gives more logical equations, simpler unit names and more useful analogies between field and circuit equations. The meaning of dimensions and the method of calculating the ratios of the sizes of different units of a given quantity are also clearly explained. The book concludes with a chapter on the relation $\mu_0\chi_0 = 1/c^2$ and appendices on field plotting, the international units, a table of conversion factors and simple experimental methods of determining μ_0 and χ_0.

We consider that the notes on field plotting are too short to be of much use and that the inclusion of exercises and a discussion of precision measurements of the ampere and other units would have been of special value. However, the book can be highly recommended to those familiar with electrical engineering principles and should help to resolve some of the difficulties of this subject.—E.L.T.

Books Received

Photoelectric Multipliers. By S. Rodda. Pp. 180; figs. 46; index. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 22s 6d.

Applied Electricity. By H. Cotton. Second edition. Pp. 482; figs. and index. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 18s 6d.

The Welding of Austenitic Corrosion- and Heat-Resisting Steels. Pp. 207; figs. and index. British Welding Research Association, 29, Park Crescent, London, W.1. Price 27s 6d.

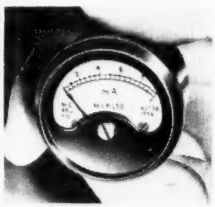
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Small Meters

THE Series 15 1·5in diameter meter, made by MEASURING INSTRUMENTS (PULLIN), LTD., Electric Works, Winchester Street, London, W.3, is designed for use in portable electronic and communications installations. It is made in two types, the non-illuminated and the illuminated. The former is available in various self-contained ranges from 50 μA to 500 mA and for voltages up to 250 V inclusive. The illuminated type can be supplied with self-contained ranges from 50 μA to 10 mA.

In the illuminated model a pigmy lamp, mounted on a specially designed assembly at the rear of the case, is inserted within the open coil of the d'Arsonval type movement. The light from the lamp passes through the translucent dial and is diffused over the scale. Lamps are supplied for either 6·3 V or 12 V and are easily replaced without disturbing the



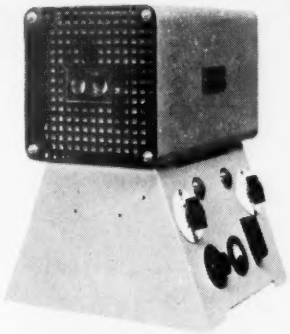
Pullin 1·5in diameter milliammeter

movement or scale. The case is of moulded material and is provided with a back-of-board metal clamp for flush fitting. All meters are calibrated for non-magnetic panels, but if steel panels are to be used the thickness of the panel should be stated when ordering.

High Temperature Tube Furnace

To meet the demand for tube muffles capable of operating at temperatures up to 1,400 deg C, thus facilitating determinations of high alloy steels, WILD-BARFIELD ELECTRIC FURNACES, LTD., Watford By-Pass, Watford, Herts, is making a new tube furnace, designated model CC22. The construction of the furnace is such that the exothermic reaction of high alloy steels at the appropriate temperatures does not harm the furnace by excessive temperature on the elements.

The new furnace is designed for bench operation and is self-contained with built-in hand



Wild-Barfield high temperature tube furnace

temperature control equipment and pilot lights. It takes two standard combustion tubes of $1\frac{3}{4}$in outside diameter. The heating chamber is 4in square and 6in heated length with well-insulated vestibules at each end to give the greatest practicable uniformity of temperature. Over a length of 4in uniformity within $\pm$ 10 deg C at 1,350 deg C is obtained, this being a uniformly heated length ample for normal carbon and sulphur determinations. There is a ventilated compartment at each end housing the connections to the heating elements, which consist of silicon carbide rods. Additionally, a tapped transformer is fitted in the base and a tap changing switch, together with the ageing control switch and pilot lights, are easily accessible on one face of the plinth. The furnace, rated at 1·75 kW, is suitable for operation on 200-250 V a.c. mains and is supplied ready for installation, with a 6ft length of three-core cable for connection to supply. Illustrated literature and further details are available on request to the manufacturers.

Double Cooker

TRICITY COOKERS, LTD., 109, Kingsway, London, W.C.2, announces the novel idea of linking two standard Tricity 528 cookers into one complete double-sized unit, with two ovens, four boiling plates, grill chamber, warming cupboard and large utensil storage space. Thus, the owner of a single 528 cooker can at

Tricity "Double 528" cooker

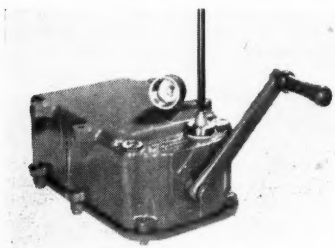
any time add a second unit. The conversion kit, together with the additional cooker, costs £25 19s. The double cooker is also offered as a complete unit for £47 3s.

Automatic Lifeboat Transmitter

A lifeboat transmitter comprising a hand driven d.c. generator and two-valve transmitter in a single casing has been developed by VENNER ELECTRONICS, LTD. It operates on a frequency of 3 Mc/s and has a range of twenty miles. The generator provides a 6 V l.t. and 370 V h.t. supply for the transmitter which consumes 9 W and has an output of 1 W. The complete unit weighs only 17 lb, measures 12in by 7in by 5in, and can be belted to the underside of the thwarts or seats of the lifeboat. An 8ft whip aerial in two sections is also provided.

To operate the transmitter it is only necessary to plug in the aerial and turn the handle. When it is being turned fast enough a neon indicator lamp glows and after about 30 seconds another light appears indicating that the S.O.S. signal is being continuously transmitted. Part of the signal is a continuous tone and rescuing ships can use it for direction finding.

Venner automatic lifeboat transmitter



Frequency-Sensitive Bridge

A bridge-network unit which enables any size of centre-zero moving coil instrument of a range of 500–0–500 μA to be calibrated and used as a frequency indicator has been developed by CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2. The circuit consists of resistors, condensers and inductances arranged in a frequency-sensitive bridge with half-wave rectifiers, giving a unidirectional output to operate the instrument.

It is claimed that the circuit is practically immune from error due to abnormal waveform and therefore gives greater accuracy than rectified bridge circuits with a calibration which is true for only one waveform at one voltage. Although this point is not covered by B.S. 89 for long-range frequency meters it is important since an instrument calibrated on one waveform will give different readings if used on another.

The instruments used in conjunction with the bridge unit comply with the B.S. 89 requirements that errors shall not be more than 1 per cent of the mean value, and with a variation of ±10 per cent from rated voltage the change in indication shall not exceed 1 per cent. The bridge is contained in a separate box about 7in by 5in by 4in deep. It is standardized for 45–65, 46–54 and 56–64 c/s and is available for use at any voltage within the bands: 100–120 V and 200–240 V. The instruments are supplied in all the usual patterns, and in addition the following are available: circular scale, any size; 3½in rectangular; hermetically sealed, sector types; and controller pattern including illuminated dial.

Transport Power Costs

NOTICE of a 15 per cent increase in electricity charges has been received by the St. Helens Transport Department from the Merseyside and North Wales Electricity Board. Reporting this at last week's meeting of the Transport Committee, the transport manager said that the increase would amount to £3,100 a year. When a member suggested that representations be made to the Electricity Board to see if the charges could be reconsidered, the manager replied that the Liverpool transport undertaking had been charged at the same rate, and it appeared to be a general policy. An assurance was given to the Committee that the representative on the Consultative Council would again voice the Committee's view.

COMMERCE and INDUSTRY

Burmese Purchasing Mission

Cable Manufacture in Egypt

THE Board of Trade has been informed that a Burmese Government Purchasing Mission will visit the United Kingdom between 5th and 25th May. The Mission will be under the leadership of the Minister of Public Works and will include representatives of the Shipping Board, the Railways, and of the Irrigation, Agriculture, Inland Water Transport and Building and Works Departments. The Mission's object will be to buy capital goods and machinery required for various Pyidawtha schemes and details of its requirements may be obtained from the Commercial Attaché at the Embassy of the Union of Burma. All enquiries, which should bear the reference number CA 184, should be addressed to the Embassy at 76, Cadogan Square, London, S.W.1 (telephone: Kensington 1195).

Fraser and Chalmers Extension

To increase its manufacturing capacity and to meet the demand for larger sets, the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd., is building a new heavy turbine shop at its Erith establishment. This new shop will have a floor area of 58,000 sq ft and be sited parallel to the existing turbine shop. It will be in two sections, the main bay 130ft by 360ft, with an annexe 40ft by 280ft. The main bay will be 57ft high to the eaves; the annexe 35ft high to the eaves. A reinforced concrete test pit will be provided in the floor of the main bay capable of accommodating up to three 120 MW sets. For running tests steam will be available at 650 lb per sq in gauge pressure and 850 deg F temperature. The main bay will be provided with two 60-ton travelling gantry cranes with main and auxiliary hoists and combined loads of 120 tons may be handled. Amongst the new machine tools which will equip the building is a large planer with two vertical and two side heads capable of machining the largest castings for 120 MW turbines. Excavations were commenced in February last and the shell of the building is due for completion during mid-1954. A new pump house integral with a reinforced concrete lined well has been built 20ft below ground level.

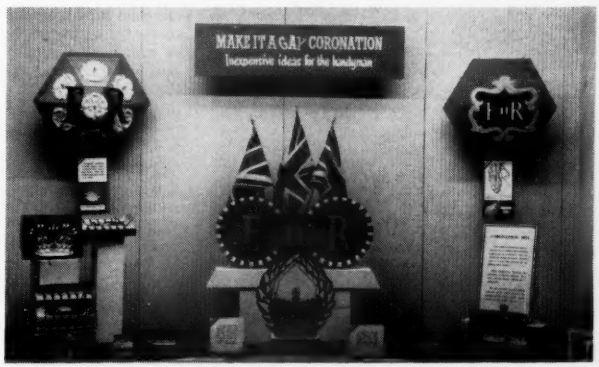
Duty-Free Machinery

The Committee on Duty-free Entry of Machinery held its first meeting on 2nd April. The Committee will welcome evidence in writing from interested persons or organizations. Letters or memoranda should be addressed to the joint secretaries, Board of Trade, Room 3135, Horse Guards Avenue, London, S.W.1, and should be submitted before 15th May. It is requested that individuals or organizations intending to submit such evidence should inform the joint secretaries to that effect at once.

Coronation Illuminations Display

The South Western Electricity Board recently staged a display at its Whiteladies Road (Bristol) Service Centre of inexpensive easy-to-make Coronation illumination fittings, based on drawings provided by the E.L.M.A. Lighting Service Bureau. The display was intended to show that every small householder or shopkeeper could have his own illuminations at very small cost. Copies of the drawings, showing how to make

A Coronation illuminations display at Bristol by the South Western Electricity Board



the fittings, were supplied free of charge from the Service Centre and the interest was so great during the week that the Bristol North district manager decided to retain the display for a further week.

Commutator Press for Austria

A 300-ton hydraulic commutator press for Elin & Co., of Weiz, Province of Styria (British Zone, Austria) has been dispatched from the Gloucester Works of Fielding & Platt, Ltd. Elin & Co. specialize in the manufacture of transformers, generators, switchgear, etc. This press is of the vertical four-column upstroking type, being self-contained and provided with hydraulic direct pumping equipment, using oil as the pressure medium.

Representation in Uruguay

A Montevideo firm of agents wishes to be put in touch with British electrical and radio manufacturers who require representation in Uruguay. They ask for catalogues and terms and we shall be pleased to pass on any communications from interested readers or give them the firm's name and address.

Instrument Works Extension

Nalder Bros. & Thompson, Ltd., recently opened an extension of their premises at Dalston Lane Works, London, E.8, and the accompanying photograph shows Mr. A. G. O'Neill, M.I.E.E., chairman and managing director, unveiling a plaque to commemorate the occasion.

Mr. A. G. O'Neill, chairman and managing director of Nalder Bros. & Thompson, Ltd., unveiling a plaque to commemorate the opening of an extension to the company's works

The company was founded in 1884 by the late Mr. F. H. Nalder, and is engaged solely on the development and manufacture of electrical instruments and protective relays. The opening of the new factory extension was marked by a lunch to employees in the newly arranged canteen.

Franco-Egyptian Cable Company

The Egyptian authorities are reported to have agreed to the establishment of a Franco-Egyptian company for the manufacture of electric cables. The initial capital of the new venture is £E100,000, half of which is to be taken up by two French firms, S. A. Electro-Câble and S.A. Tréfileries et Laminoirs du Havre. At an early date the share capital is to be increased to £E250,000. Production is to start towards the end of this year and is to cover approximately three-quarters of Egypt's requirements, the total value of which is estimated at about £E2,000,000. The new company's products are also to be exported to the countries of the Middle East.

F.B.I. Report

Once again the report of the Federation of British Industries presented at the annual meeting last Wednesday is a record of a very wide range of activities at home and overseas during the past year. Productivity, taxation, transport, iron and steel, fuel and power, valuation and rating, export credit guarantees and overseas markets are some of the subjects covered.

Airfield Ground Power Unit

A prototype airfield mobile ground power unit, which is claimed to be the largest of its kind in the world, has been developed by Petbow, Ltd., Sandwich, Kent. It has a maximum output of 90 kW and is driven by a six cylinder Dorman diesel engine developing 160 b.h.p. at 1,500 r.p.m. The generator is a double unit providing both 28 V and 112 V supplies, and it has been specially designed and made by Laurence, Scott & Electromotors, Ltd. A continuous output of 450 A is available on both supplies for servicing and testing and on the 112 V side the maximum momentary output for engine starting is 800 A.

Contractors' Coming-of-Age

To commemorate their coming-of-age, Escott Brothers, Ltd., South Woodford, entertained a large gathering of trade friends, who included well-known men in the electrical industry, architects and builders, to a dinner and dance held at the Connaught Rooms, London, on 8th April.

The company was formed in 1932 by two brothers, Mr. A. J. Escott, A.M.I.E.E., and Mr. L. H. Escott, as an electrical contracting concern, with a small showroom at Woodford.

Mr. A. J. Escott being chairman and managing director. The business has expanded rapidly and there are now fourteen branches in the East London Area. In 1936 Mr. S. A. Cordell became a director and after the war Mr. L. E. Allen joined the board. During the war the scope of the business was widened in a number of directions.

Mr. L. H. Escott proposed the toast of the guests and in responding Mr. C. J. Veness, managing director of J. G. Sneath, Ltd., and retiring chairman of the London Branch of the E.C.A., referred to the good work done by Mr. A. J. Escott on behalf of the Association. The toast of the company was proposed by Mr. W. Crisp, sales director of Young & Wildsmith and vice-president of the Electrical Wholesalers' Federation, and Mr. E. J. Escott responded. Dancing and a cabaret followed the dinner.

A display caravan and radio van belonging to the Midlands Electricity Board, set up outside a new block of flats for Foreign Office workers at Cheltenham

Glasgow Engineering Centre

The directors of the Engineering Centre, Ltd., Glasgow, have resolved to close the Centre on 30th September next. They state that certain industries, trade associations and large manufacturers have shown preference for arranging their own exhibitions of their products and the tendency is for these organizations to select areas of their own choice for such displays. They consider that when these new sectional enterprises become firmly established it would be impossible to carry on the existing Engineering Centre as a permanent exhibition which would be truly representative of the engineering industry as a whole.

Motors for Royal Yacht

Over 120 motors ranging in size from 0·5 to 96 h.p. and totalling nearly 1,200 h.p., are being supplied to the new Royal Yacht for many duties by Laurence, Scott & Electromotors, Ltd. The vessel is being built by John Brown & Co. and was launched by the Queen this week. Laurence, Scott supplied what they believe was probably the first electric ship's winch to the Royal Yacht *Victoria and Albert* in 1902.

M.E.B. Enterprise

When a party of Foreign Office workers arrived to take over blocks of flats, built for them at Cheltenham, a caravan showroom of electric cookers and appliances sent by the Midlands Electricity Board was waiting for them. With the caravan was a radio van, in contact with the main stores, so that any appliances ordered could be rushed direct to the flats and fitted without delay.

Non-Ferrous Metals Price Control Ended

The Minister of Supply has made the Copper, Zinc, etc., Prices (Revocation) Order, 1953 (S.I. 1953 No. 604), abolishing price control on secondary copper and copper scrap. These are now in good supply and are selling below the controlled maximum prices. This Order will have the effect of bringing to an end the last statutory control over the price of non-ferrous metals.

Projection and Stage Arcs

The British Standards Institution has issued B.S. 1964 : 1953 relating to the tolerances on the diameter of high- and low-intensity plain and copper-coated carbons of 6 to 14 mm diameter for projection arcs and plain and copper-coated carbons of 10 to 25 mm diameter for stage arcs. If the carbon holders in equipment are designed to accommodate carbons within the tolerances laid down in this Standard, dimensional interchangeability of the carbons will be assured. Copies of this specification may be obtained from the B.S.I., 24, Victoria Street, London, S.W.1, price 2s.

Works Visit

The Mayor of Tottenham, Councillor K. A. E. Gregg, J.P., recently visited the works of the Benjamin Electric, Ltd., at Tottenham, and made an extensive tour, including the offices and new research laboratories, and displayed keen interest in the many processes involved in the manufacture of lighting reflectors. He is

The Mayor of Tottenham at the works of the Benjamin Electric, Ltd., with Mr. H. G. Campbell, joint managing director (right), and Mr. L. R. Kavanagh, works director (left)

seen in the picture with Mr. H. G. Campbell, joint managing director, and Mr. L. R. Kavanagh, works director.

B.E.A.M.A. and the Public

Since the war, and particularly since the fuel and power crisis of 1947, the electrical industry has had to bear much ill-informed criticism and has also suffered from widespread ignorance of its services to the public and to industry. Individual manufacturers have done something to counteract the adverse effects upon electrical trade and now the British Electrical and Allied Manufacturers' Association is making a special endeavour to raise the standing of the industry in the political world and with the general public.

For this purpose it has appointed Editorial Services, Ltd., as its public relations advisers. This concern has already made a comprehensive survey at the Association's request and its public relations work will be under the personal supervision of Mr. Claude Simmonds, managing director of Editorial Services. The work will be carried out in close conjunction with the B.E.A.M.A. Electricity Development Committee, of which Mr. A. S. Lowe is secretary.

Power Station Dispute

The Tyne District Committee of the Amalgamated Engineering Union has resigned *en bloc*, because of the National Executive's attitude to the overtime ban by craftsmen at Dunston, Carville and South Shields power stations. The men concerned have complained that as a result of recent wage adjustments, unskilled men are able to earn as much as, and in some cases more than, skilled workers. The British Electricity Authority has pointed out that wage rates are settled nationally between the B.E.A. and the A.E.U. The National Executive of the union has instructed the Tyneside men to return to normal working. About 100 men are involved in the overtime ban which was imposed on 19th February.

Large Electrode Furnace

In the article on this subject in the *Electrical Review* of 20th March describing the new 20 ton swinging roof Birlec plant which has been installed at the Hadfields East Hecla Works, Sheffield, we referred, on p. 615, to the main transformer supplying the furnace as having secondary tappings by which "on-load tap-changing is effected." This is incorrect; in fact, the switch, although of the on-load tap-changing type, is arranged for *off-load* operation. This means, of course, that the switching arrangements were designed for extremely rigorous operation.

Electric Tool Makers' New Branches

Two new sales and service branches have now been opened by Black & Decker, Ltd., at 29, Broad Street, Bristol, and 27–31, Wollaton Street, Nottingham. Both branches are staffed

The workshop at the new Bristol branch of Black & Decker, Ltd.

h trained personnel and are fully equipped to g e users of portable electric tools efficient s rvice. The workshop at the Bristol branch is shown in the accompanying illustration.

Switchgear Demonstration

The General Electric Co., Ltd., recently gave a series of demonstrations of its latest design of distribution switchgear at Magnet House, Kingsway, London. The demonstrations were attended by over 250 engineers who included representatives from the British Electricity Authority, Ministry of Supply, Air Ministry and other Government Departments in addition to consulting engineers. The visitors were given the opportunity of inspecting the construction and operation of the equipment and of going into technical details with the company's engineers.

Guards for Heaters

It is regretted that in the article on this subject dealing with the new Heating Appliances (Fireguards) Regulations, 1953, there was an omission of the figure "1954" in one paragraph. It should have read: "Appliances, other than imported appliances, manufactured before the date of the coming into operation of the regulations may be sold or let on hire or hire-purchase at any time before 1st October, *1954*."

Fair Trading Policy

The Electrical Fair Trading Council, Sardinia House, Sardinia Street, Kingsway, W.C.2, has published a new edition (No. 5) of the Electrical Fair Trading Policy. This embodies all the amendments which have been made since the appearance of the fourth edition in May, 1950. Extra copies are obtainable from the secretary at 2s each.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £161 0s 0d
COPPER, H.C. Electro	ton £280 0s 0d
Fire Refined 99·70 per cent ..	ton £272 0s 0d
Fire Refined 99·50 per cent ..	ton £269 0s 0d
COPPER Tubes	lb 2s 7½d
Sheet	ton £333 10s 0d
H.C. wire and strip	ton £312 5s 0d
LEAD, English	ton £88 5s 0d
Foreign	ton £87 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £730 0s 0d
ZINC, G.O.B. Foreign	ton £74 0s 0d
Electrolytic	ton £74 10s 0d
BRASS Tubes	lb 2s 1½d
Sheet	ton £262 5s 0d
Wire	lb 2s 7½d
PHOSPHOR BRONZE	
Wire	lb 4s 1d
RUBBER, No. 1 R.S.S. spot ..	lb 20d–21¼d

Trade Announcements

British Electric Lamps, Ltd., has recommenced manufacturing the "Gothic" olive candle lamp. Other types of candle lamps which were in short supply after the war, as well as others the manufacture of which was discontinued during the war, can now be supplied.

E. K. Cole, Ltd., in conjunction with **Harold Goodwin (1944), Ltd.,** will hold an "Ekco" car radio sales and service week in Goodwin's showrooms, 50-52, Broad Street, Birmingham, from 20th to 25th April.

Ekco-Ensign, Ltd., has appointed Mr. R. Sullivan as representative for the greater part of the South Lancashire area. He will operate from the company's northern sales office, Kent Street Works, Preston.

British Insulated Callender's Cables, Ltd., announce that their overseas reception office has been transferred to 11, Bedford Square, London, W.C.1 (telephone : Museum 1600).

A branch has been opened by the **Craigpark Electric Cable Co., Ltd.,** at 75, Hanover Street, Edinburgh, 2 (telephone : Edinburgh 31403).

Catalogues and Lists

United Steel Companies, Ltd., 17, Westbourne Road, Sheffield, 10.—52-page booklet dealing with the companies' new central research and development department at the Swinden Laboratories, Rotherham.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—Illustrated technical brochure on "Metrovick" infra-red projector units.

Joyce, Loebl & Co., Ltd., Vine Lane, Newcastle-on-Tyne, 1.—Leaflet illustrating low-voltage power units for school and technical college laboratories, etc. (52/4A).

Bakelite, Ltd., 12-18, Grosvenor Gardens, London, S.W.1.—28-page booklet on Bakelite laminated non-metallic gears.

Brentford Transformers, Ltd., Kidbrooke Park Road, London, S.E.3.—Illustrated catalogue introducing the Brentford on-load voltage regulator.

Prentice, Ltd., Gelderd Road, Leeds, 12.—Illustrated and priced folder relating to "Prenlock" composite control units (501).

Reeves & Co. (B'ham), Ltd., 40, Bloomsbury Street, London, W.C.1.—Price list of lighting fittings accessories, lampholders, etc.

S. N. Bridges & Co., Ltd., Bridges Place, Parsons Green Lane, London, S.W.6.—Leaflet illustrating a range of portable electric drills and accessories.

NEXT WEEK'S EVENTS

Sunday, 19th April, to Tuesday, 21st April

EASTBOURNE.—Queen's Hotel. Association of Electrical Machinery Trades. Annual convention.

Monday, 20th April

BIRMINGHAM.—Midland Hotel, 6.15 p.m. Birmingham Electric Club. "The Automatic Pilot and other Servo Mechanisms in Aircraft," by F. W. Meredith.

BRISTOL.—Electricity House, 7 p.m. I.E.E. Bristol Students' Section. "Hydrogen Cooled Alternators," by T. O. Jones.

LIVERPOOL.—Radiant House, Bold Street, 7.15 p.m. Incorporated Plant Engineers, Liverpool and North Wales Branch. "The Engineer and the Brewing Industry," by G. W. Campbell.

LONDON.—Savoy Place, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Laboratory Experiments on Protective Gear," opened by H. P. Young.

At the Royal Society of Arts, John Adam Street, W.C.2, 6 p.m. Institution of Engineering Inspection. "Inspection in Industry," by Dr. J. Barnett.

35, Grosvenor Place, S.W.1, 7 p.m. Women's Engineering Society, London Branch. "Design of Water-Tube Boilers," by Miss J. E. Gardiner.

St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Industrial Fire Protection," by E. M. Woodman.

Tuesday, 21st April

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "The Stability of Oil in Transformers," by P. W. L. Gossling and L. H. Welch, and "Inhibited Transformer Oil," by W. R. Stoker and C. N. Thompson.

351, Sauchiehall Street, 7 p.m. Incorporated Plant Engineers, Glasgow Branch. "Mobile Mechanical Handling Plant," film.

GREAT MALVERN.—Winter Gardens Restaurant, 7.15 p.m. I.E.E. South Midland Centre, Worcester and Malvern District Meeting. "Electronic Telephone Exchanges," by T. H. Flowers.

HUDDERSFIELD.—Y.E.B., Market Street, 6.30 p.m. I.E.E. North Midland Students' Section. "Electricity Supply in South Africa," by J. M. Stancliffe.

HULL.—Yorkshire Electricity Board, Ferensway, 7.15 p.m. North Midland Centre. District meeting. "The Economics of Low-Voltage Electricity Supplies to New Housing Estates," by F. G. Copland.

LEICESTER.—Bell Hotel. Institution of Works Managers Leicester Branch. Annual general meeting.

LIVERPOOL.—Electricity Board's Service Centre, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "Shop Window Lighting," by A. W. Jervis. (Joint meeting with British Display Association.)

LONDON.—Café Royal, 6.45 for 7.15 p.m. I.E.E. Supply Section. Dinner-dance.

2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Electrical Appliances—Notes on Design and Testing," by J. I. Bernard.

NEWCASTLE-UPON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture, "Light from the Dark Ages, or the Evolution of Electricity Supply," by A. R. Cooper.

ST. ALBANS.—Peahen Hotel, 7.30 p.m. Incorporated Plant Engineers, Hertfordshire Discussion Group. "Industrial Lighting," by W. S. Veness.

WEALDSTONE.—Railway Hotel, 7.15 p.m. Purchasing Officers' Association, Watford and Harrow Group. Film show and talk, "The Plain Man's Guide to Plastics," by T. L. Ralph.

Tuesday, 21st April, to Thursday, 23rd April

FOLKESTONE.—Public Transport Association. Annual Conference.

Wednesday, 22nd April

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Stability of Oil in Transformers," by P. W. L. Gossling and L. H. Welch, and "Inhibited Transformer Oil," by W. R. Stoker and C. N. Thompson.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. "An Investigation of the Characteristics of Cylindrical Surface Waves," by Prof. H. M. Barlow and A. E. Karbowiak, and "Surface Waves," by Prof. H. M. Barlow and Dr. A. L. Cullen.

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. Informal meeting. "Reorganization—The First Five Years from an Area Angle," by F. E. Plumpton and L. W. Rapkin.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "Television Broadcasting Stations," by P. A. T. Bevan.

Wednesday, 22nd April to Saturday, 25th April

HARROGATE.—Hotel Majestic. Institute of Metal Finishing. Spring Conference.

Thursday, 23rd April

EDINBURGH.—Central Halls, 7 p.m. I.E.E. South-East and South-West Scotland Sub-Centres, Faraday Lecture. "Light from the Dark Ages, or the Evolution of Electricity Supply," by A. R. Cooper.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. ordinary meeting. "The Forty-fourth Kelvin Lecture. "The Dilemma of Lord Kelvin," by Prof. P. I. Dee.

Caxton Hall, Westminster, 6 p.m. Engineers' Guild. "Freedom in Engineering," by A. Floyd.

SWANSEA.—Mackworth Hotel, High Street, 7.30 p.m. Purchasing Officers' Association, West Wales Branch. Film and talk, "Manufacture of Electric Lamps," by F. M. McPherson.

Friday, 24th April

LONDON.—Connaught Rooms, 6.15 for 6.45 p.m. Junior Institution of Engineers. Annual dinner.

Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "Fuel-oil Ash Deposition in Open-cycle Gas Turbines," by Dr. A. T. Bowden, P. Draper and H. Rowling.

STAFFORD.—Oddfellows Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Annual general meeting. "Post-Graduate Activities in Electrical Engineering," by W. J. Gibbs, D. Edmundson, R. G. A. Dimmick and G. S. C. Lucas.

Saturday, 25th April

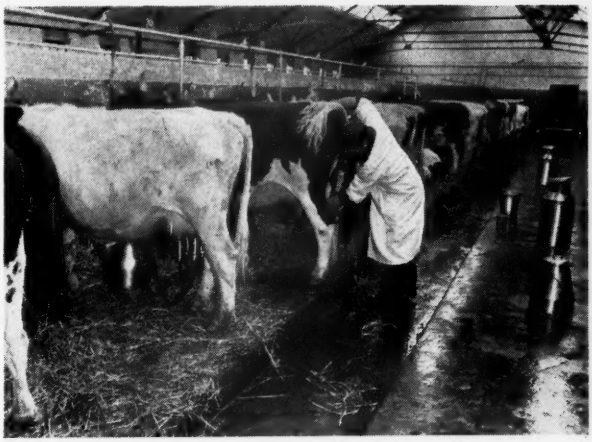
LONDON.—I.E.E. London Students' Section. 2.30 p.m. Visit to B.B.C. Tatsfield Monitor Station, Surrey.

E.I.B.A. Activities

THE Kent Branch of the Electrical Industries Benevolent Association is holding its annual general meeting on 29th April at the Royal Star Hotel, Maidstone. Mr. H. Drake, president of the E.I.B.A. will address the meeting.

The Manchester Branch of the Association has recently handed over a cheque for £1,375 to headquarters as the final profit made on the recent annual dinner and dance.

A bucket type machine is used to milk the herd of 163 Ayrshire cows

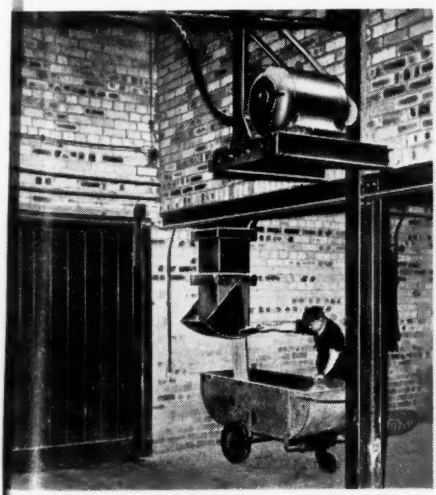


Large Dairy Farm

Milk Treatment on a Commercial Scale

METHODS normally associated with the larger commercial dairies have been adopted at the National Coal Board's East Moor Dairy Farm, Ellington, Northumberland, where the milk from a herd of 163 Ayrshire cows and from neighbouring farms is taken straight to the dairy, cooled, bottled, etc., the bottle washing, sterilizing and bottling being carried out on a continuous conveyor system. The output of milk is between 900 and 1,100 gallons per day.

A 6 h.p. motor drives a cake breaker for grinding part of 4 tons of cattle food required each week



An Alfa Laval bucket type machine driven by a 1½ h.p. Brook motor is employed for the milking, the milk collected being tipped into two specially designed stainless steel receiving tanks where it is pumped through a special filter and over a cooler and then to a 200 gall storage tank ready for bottling.

The U.D. Engineering washing and bottling machine is designed to handle 600 gall of milk an hour. It incorporates a pre-soaking tank maintained at a temperature of 100 deg F, a main caustic soak tank where the temperature is raised to 140 deg F and a cooling tank (110 deg F). Crompton Parkinson "Klosd" motors of 4 h.p. and 2½ h.p., with Allen West direct-on starters, drive respectively the Gwynne's pumps and the continuous conveyor.

Another Crompton Parkinson motor of 1 h.p. drives the conveyor carrying the clean bottles to the automatic filling and capping machines. Filled bottles after inspection are placed in crates, which travel from the washing machine on another conveyor driven by a 1½ h.p. Brook motor.

(1) The milk is tipped into stainless steel receiving tanks whence it is pumped through a special filter and over a cooler and then to a 200 gall storage tank ready for bottling. (2) Ammonia compressor serving the cold room and milk cooler. (3) 1,000 gall of milk can be stored in this cold room. (4) This automatic bottle washing and filling machine is capable of dealing with 600 gall of milk an hour

The crates of full bottles are stored in a cold room capable of accommodating 1,000 gall of milk, refrigeration being provided by the ammonia compressor unit (with a 4½ h.p. Crompton Parkinson motor) which cools the milk.

To feed the total of 200 stock kept on this N.C.B. farm 4 tons of feeding stuff is required each week. Some of the cattle cake is processed by a cake-breaker belt driven by a 6 h.p. motor. A new piece of apparatus which has just been installed is a "Nu-way" mechanical stoker for the solid fuel boiler installation. Macintosh insulated rotary switches are employed throughout.

At the moment the installation is supplied from the N.C.B.'s own 3 kV network through a 50 kVA 3-phase transformer, but shortly the supply is to be taken over by the North Eastern Electricity Board.

New E.A.W. Branch

THE latest E.A.W. branch to be formed, the Evington Parks Leicester Branch, has since 1944 done excellent work as a Group of the main Leicester Branch. Branch status was conferred on this Group at a recent meeting when Miss E. M. A. Wilson, organizer of domestic subjects for the City of Leicester Education Department, the new president, was in the chair. Speakers included Dame Caroline Haslett, Mr. D. H. Parry, sub-area manager, E.M.E.B.; Mrs. F. E. Oliver, president of the Leicester E.A.W. Branch; and Miss Waite, immediate past-chairman, Leicester Branch.

ELECTRICITY SUPPLY

Merseyside Board's Tariff Policy

Rural Progress in S.W. Scotland

MR. J. Eccles, chairman of the Merseyside and North Wales Electricity Board, said at Chester last week that the Board had decided to delay any further increases in domestic, commercial and industrial tariffs until every other method of offsetting rising costs had been exhausted. He was addressing a conference convened by the Merseyside and North Wales Electricity Consultative Council, which was attended by more than 250 delegates. Since the latest tariff was introduced there had been increases in costs of fuel, materials and labour, he pointed out. The recent increase of 10 per cent in the pithead price of coal would cost the Board £600,000 a year. In the past five years the Board had supplied electricity to 124,000 new consumers, including 3,325 farmers, and had laid or erected more than 2,000 miles of cable and introduced more than 480 miles of new street lighting.

Mr. H. Evans, chairman of the Consultative Council, said that there was still room for improvement in co-operation with some local authorities. He denied that local authorities were not adequately represented on the Consultative Council.

Houses and Overhead Lines

Billingham-on-Tees U.D.C. proposes to develop additional housing land in the Roseberry Road area across which an overhead line has been erected. The North Eastern Electricity Board has pointed out that to place the line underground would cost £21,000, but assurance has been given that in the event of the line being damaged or broken the power would be switched off automatically. The Council has decided to purchase the land, subject to the bases of towers in back gardens being protected by barbed wire.

Planned Rural Development

A symbol of the transition to modern methods in the rural districts of Scotland is the electric teamaker now used at Ballagan Farm, near Balloch. The apparatus is the gift of the S.W. Scotland Electricity Board and was presented when Mr. D. L. Stewart, convener of Dumbartonshire, operated a switch to put the farm "on the mains." Gifts are not usually made when electricity is installed, but Ballagan is the 2,500th farm in the Board's area to be connected, thus dispensing with oil lamps and adopting modern methods of cooking and milking.

Mr. James Gogan, chief commercial officer, reviewing the progress made since vesting day, pointed out that previously supplies to farms and villages had all too often been dealt with piecemeal, there being a marked tendency to neglect the small farms and hamlets which were remote from existing power lines. The Board had decided that rural electrification must be dealt with by properly planned development programmes. Accordingly, early in 1950 a development programme was adopted for each of the Sub-Areas and it was noteworthy that 66 per cent of the total number of farms in the Area were now connected to the Board's supply, a figure believed to be the highest attained by any Board in the United Kingdom. In the Clyde Sub-Area, where Ballagan Farm was situated, over 80 per cent of the farms were now connected. In view of the results so far obtained, it was confidently expected that all the programmes would be finished before 1957 and that many individual schemes would be connected as much as three years ahead of the target date.

Industry in the Highlands

If the North of Scotland Hydro-Electric Board introduced a scheme to enable prospective industrialists to obtain cheaper power than elsewhere, it would be a big step towards attracting industry to the Highlands and would help to stop depopulation. This was one of the chief conclusions reached at a recent meeting of the Local Authorities' Hydro-Electric General Committee at Inverness. The Committee was discussing the terms of a memorandum dealing with hydro-electric development and the benefits to be derived from it in relation to Highland rehabilitation prepared by General Sir James Gammell, chairman of the Committee.

Disappointment over a faded "vista of Highland prosperity" envisaged when the North of Scotland Hydro-Electric Board came into being was expressed in Edinburgh at the annual convention of the Royal Burghs of Scotland. The convention agreed to a resolution urging the Board to make power available where it

was generated at a price which would attract industry. Provost G. A. Macfarlane, who moved the resolution, said that schemes to check Highland depopulation were proving insufficient. Electric power generated in the Highlands was mainly used for transfer to industrial areas in the South without compensation to those living in the area. Without preferential treatment industry could not possibly be attracted.

Electricity in Lake District

The North Western Electricity Board is being urged to provide electricity supplies as soon as possible for the Borrowdale and Langdale valleys. The Board is also being asked to submit to the Lake District National Park Planning Board details of the routes of proposed overhead lines so that agreed routes can be settled.

Coastal Transmission Line

The British Electricity Authority has applied to the Ministry of Transport for consent under the Coast Protection Act, 1949, to erect a 132 kV overhead transmission line across Lemington Gut near Newcastle-on-Tyne. The line will give a clearance of 43ft above high-water mark.

Distribution Reconstruction

Sunderland Town Council has approved the reconstruction and extension of the low voltage network at East and Middle Herrington in connection with the transfer of the system from the Durham Coal Board to the North Eastern Electricity Board.

Electric Cooking

Heywood Housing Committee has recommended that electric cookers shall be installed in a quarter of the total number of houses to be built on the Egerton Street site. This follows a request by the North Western Electricity Board that the Committee should consider providing electric cooking facilities in a proportion of its new houses.

Substation Site

At Broadstairs on 31st March, Mr. H. W. Grimmitt, of the Ministry of Fuel and Power, opened an inquiry into an application by the South Eastern Electricity Board to acquire by compulsion a plot of land owned by Councillor W. G. Woodward.

Mr. H. J. C. Carte, district manager of the Board, stated that it was essential to have two substations to reinforce the supply for the d.c. to a.c. conversion. One had already been built at Dumpton Gap and a site was sought for the other. As no suitable site had been found at a price the Board was allowed to pay, a transformer had been placed at Gladstone Road as a purely temporary expedient. Alternative sites had been inspected, but Councillor Woodward's was the most suitable.

Councillor Woodward said that the site was part of a plot on which he proposed to build a bungalow for his own use. He had been granted a building licence. If the Board would have accepted an alternative site but for the price, how could it say that his site was the most suitable? He was willing to sell a plot farther along the road. The result of the inquiry will be announced later.

Canadian Water Power Resources

As a result of recent revisions of the data for the Provinces of Quebec and Newfoundland, the estimated water power resources of Canada under average flow conditions have been appreciably increased. The annual review of the Department of Resources and Development assesses the resources at nearly 51 million h.p. at average flow, this figure representing a feasible turbine installation of nearly 66 million h.p. The total turbine installation at the end of 1952 is given as 14,305,880 h.p., indicating that slightly less than 22 per cent of available resources has been developed. The provinces with the greatest installed capacity are Quebec, 7,263,621 h.p.; Ontario, 3,948,466 h.p.; and British Columbia, 1,432,858 h.p. The installed capacity of water power plants in Canada now equals 991 h.p. per thousand of the population. Copies of this review may be obtained free of charge on application to the Water Resources Division, Department of Resources and Development, Ottawa.

Choice of Service

An offer by the Midlands Electricity Board to divert overhead lines which at present cross the Stone Rural District Council's Green Lane, Eccleshall, housing estate free of charge on condition that houses to be built there are not fitted for gas and are provided with electric wash boilers and points for electric cookers was discussed at a recent meeting of the Council. The Housing Committee at first accepted the offer, and rejected the Gas Board's counter-offer to meet part of the cost of laying gas pipes, but the Council decided that the matter should be referred back for further consideration.

Street Lighting

A ten-year plan for converting the street lighting of PADDINGTON from gas to electricity has been approved by the Borough Council. The Works Committee has submitted a detailed programme for the next three years covering the re-lighting of the main roads.

DARLINGTON Town Council has approved the installation of additional electric street lamps in Kensington Gardens, Fenby Avenue, Tennyson Gardens, Coleridge Gardens, Roslyn Street, and on the R.O.F. estate, Yarm Road and East Cemetery housing sites.

Marine Switchgear

Fifty Years' History of Achievement

THOUGH having several other important interests, particularly in the traction field, Whipp & Bourne, Ltd., throughout their fifty years' existence—the company celebrate their jubilee this year—have concentrated their activities very largely on marine switchgear. A large proportion of their total production is destined for use in ships.

The company started at a small works in Molesworth Street, Rochdale, where the original design of the " Reliance " a.c. and d.c. air-break circuit breaker was evolved; this in improved form is still the basic feature of the company's marine switchgear. A larger factory was taken over at Castleton in 1907. After a fire in 1929, this factory was extended, the machine shop was completely rebuilt and re-equipped, and a new modern office building was erected with frontage on the Manchester–Rochdale road.

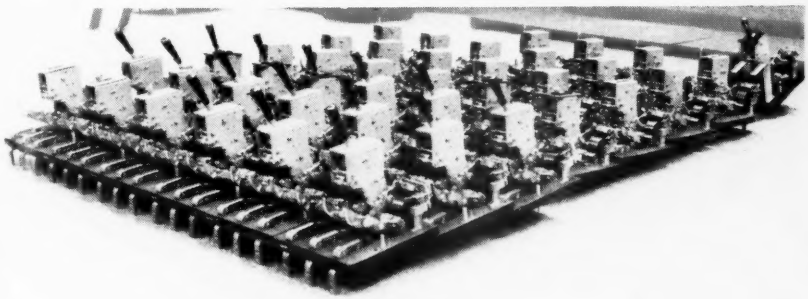
To this original factory at Castleton extensions comprise newly laid out metal stores, drawing office, private and general offices, and reception, blueprint, copying and photographic reproduction rooms. An up-to-date canteen is provided and there are dining rooms for the directors, office staff and workers.

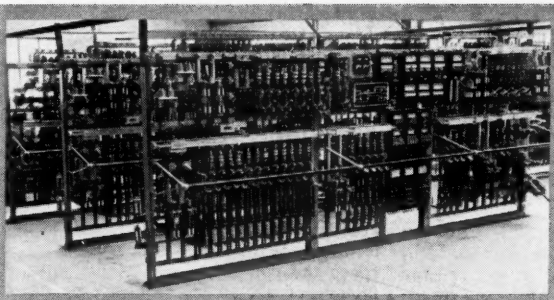
Now comprising about 117,000 sq ft of floor area and absorbing the bulk of the local labour, this factory covers all the available building space in the vicinity. Therefore to meet the need for further production space the company has opened a branch factory of 22,500 sq ft floor area on the Queenslie Estate, Glasgow.

Of the most up-to-date single-storey design, the new Glasgow factory is being used for the manufacture, not only of such standard items as a.c. air circuit breakers, knife switches, etc., but also various special items. The circuit breakers produced are of a type now adopted for a wide range of the company's switchboards. They are made up in capacities of up to 900 A in both fixed and withdrawable types, and can be operated either by hand or electrically. Each contact finger, which incorporates both main and arcing contacts, is rated at 300 A and thus the 300, 600 and 900 A capacity circuit breakers have respectively one, two and three contact fingers per phase. Above 900 A the breakers are fitted with moving contacts of the laminated brush pattern with auxiliary arcing horns.

The circuit breakers are normally supplied with series wound overcurrent trips which can be either instantaneous or fitted with time lags. Alternatively they can be fitted with current transformer operated overload features. No-volt or shunt trip releases can be fitted for operation by relays

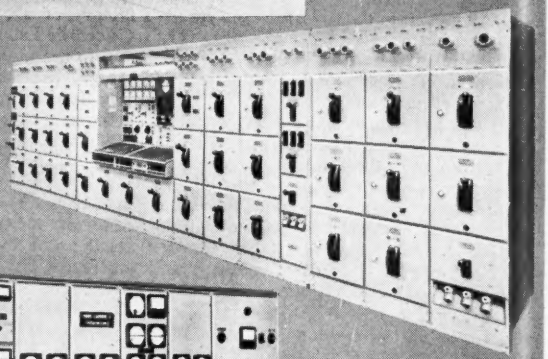
Group of a.c. circuit breakers ready for test

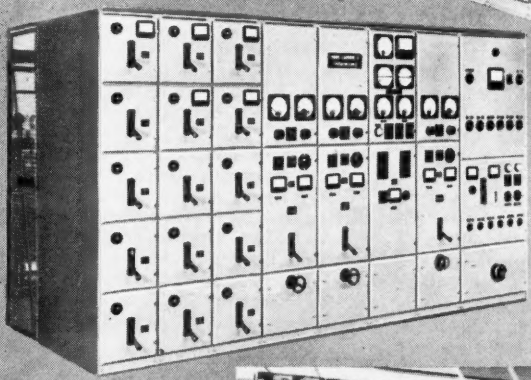




Portion of a naval switchboard

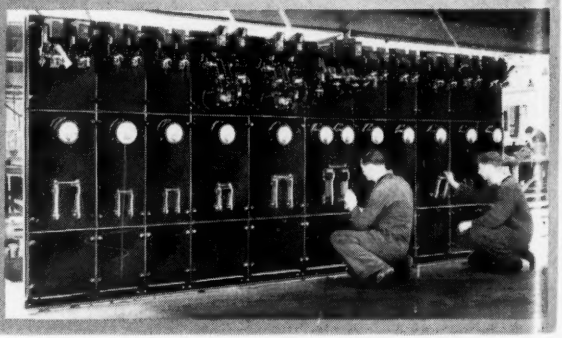
Marine switchboard for use at 440 V a.c.





Switchboard for an 18,000 ton tanker

Switchboard in course of erection for an Australian steelworks



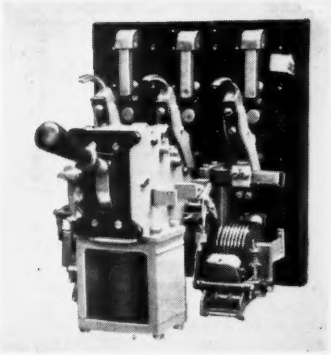
used in various types of circuit protection. The isolating mechanism, when supplied, is of the horizontal draw-out pattern, and the equipment is subjected to breaking capacity tests.

When we recently visited both this factory and the main works at Rochdale, we saw many of these circuit breakers being incorporated in switchboards for naval and merchant vessels. A typical unit seen at Glasgow was the first of eighteen boards being produced for use in the Anglo-Saxon Petroleum Co.'s tankers. They will control the output from two 550 kW 440 V turbo-alternators and a 200 kW diesel set as well as provide for an incoming supply from the shore. Altogether seven circuit breakers and four switch-fuse units ranging from 100 A to 900 A are incorporated, the largest units governing the main supplies from the turbo-alternators being arranged for both manual and electrical operation. All the switches and circuit breakers are withdrawable from the front and are arranged to drop down out of the way to give easy access to the wiring. The isolating gear is mechanically interlocked and there are special facilities for earthing. All the auxiliary wiring fuses are grouped in a central panel. The board is only 9ft 3in wide, 7ft high and 5ft 4in deep.

Apart from three complicated yet neat naval switchboards designed to ensure maintenance of supplies throughout the vessels under all conditions, there was also nearing completion at the Glasgow works a d.c. board for an Australian steelworks. Just before our visit a quantity of a.c. air circuit breakers had been despatched to Vancouver. The largest job so far tackled here has been the production of a thirty-two panel board 61ft 6in long for a steelworks in South Wales.

Many other tanker switchboards of basically similar design to those referred to were in course of erection at Rochdale as well as boards for a number of other vessels, including the P. & O. s.s. *Arcadia* and *Iberia* and the first of several Venezuelan destroyers being built in this country. Some of the circuit breakers under construction are designed to carry up to 20,000 A.

Although a large proportion of the company's production is concerned with marine switchgear it has several other important interests, particularly in the traction field. At the two factories, we noticed, for instance, a heavy current l.v. switchboard for a



Close-up of a 300 A circuit breaker

Scottish steelworks and four associated d.c. switchboards for rolling mill duty, large motor-operated regulators and high-speed circuit breakers. The last-mentioned items, which are made for voltages up to 3,000 V d.c., take about 10 milliseconds to operate on short circuit and are in demand for use on electric railways.

Swiss Electrical Manufacture

LAST year Swiss manufacturers of electrical equipment were confronted with a contraction in the volume of new orders, primarily occasioned by the resurgence of protectionist tendencies in various importing countries and, to a lesser extent, also by the general expectation of lower prices. Consequently, prices yielded ground under the impact of increasing competition while specialities could still be sold satisfactorily.

Exports were well maintained as a whole, the decline from the record figures for 1951 amounting only to 3·6 per cent in value. Makers of electric traction equipment worked almost exclusively for the home market, whereas in 1951 deliveries of electric locomotives to foreign customers reached a value of 7,700,000 fr. The active domestic demand for heavy apparatus and equipment continued in view of the expansion in power generation. While exports of this class declined about 5 per cent from the level attained about a year ago, they were reported as satisfactory as regards control devices and general instruments. Sales of motors and of smaller electrical appliances were maintained in the last few months of 1952, after having drifted downwards for a while. On the whole, business is considered to be such as to guarantee satisfactory employment for at least 12 to 15 months.

Financial Section

STOCKS and SHARES

ON the eve of the Budget, Stock Exchange markets were occupied to a greater extent than usual with affairs other than the Chancellor's intentions. Speculation about events in the international scene, and their probable implications, continued to form conclusions unfavourable to shares connected with copper and other commodities, and with munitions work on a large scale. At the same time, a wide range of industrials was unsettled by Wall Street's nervous reaction to the possibility of a changed set of circumstances. Gilt-edged stocks gained in favour at the expense of more speculative securities. By now, markets will have gone some way towards adjusting themselves to Mr. Butler's new proposals, and many of the prices entered in the accompanying share lists may have been affected.

Price Lists

Reference to the price lists published each week with these notes may be taken as an opportunity to explain that they are based regularly on middle prices taken from the Stock Exchange Daily Official List of quotations. Correspondents occasionally point out differences existing between these prices and the figures which they see given in the newspapers, or which they obtain from the market. It is, indeed, the case that the Official List is often insensitive to comparatively small price changes and sometimes slow to make larger adjustments. It is, however, the final authority in matters affecting the value of securities quoted in the Stock Exchange, and has consequently been adopted here as the most satisfactory basis.

Reyrolle Dividend

Despite the excellent profits statement which accompanied it, the final dividend of 7½ per cent declared at the beginning of the month by A. Reyrolle & Co. apparently fell short of the most optimistic expectations, which had run up the price of the shares this year from 51s 3d to 60s at one time. They were 58s 6d immediately before the announcement, after which they were marked down to 55s. Dividends for the year total 12½ per cent, an increase of 2½ per cent on the previous figure, allowing for the intervening share bonus. If some people managed to find cause for disappointment in the company's decision to adhere to a strictly conservative dividend policy (the latest total appears to be covered six or seven times over by the surplus available for dividends and reserves), there are few grounds for it in the figures for the year. Profits have expanded by more than half a million to £2,650,000, but a faster rise in taxation charges, at £1,755,000, kept the net figure down to about the previous level of a little under £900,000.

Telephone Properties

Fluctuations in the price of Telephone Properties £1 shares have been nothing short of hectic since the company's announcement, at the beginning of the month, to the effect that negotiations were proceeding in connection with the Venezuelan Government's expressed desire to purchase the ordinary shares of the operating company. Having already doubled in value in anticipation of some such announcement, the price of the shares subsequently rocketed from under 70s to 112s 6d, and, later, swung violently between that figure and £5. At 5½, the price was 48s 9d higher than it stood only three weeks previously. The usually staid shares of Telephone & General Trust, which controls Telephone Properties, became sympathetically agitated, rising to about 42s (against 29s a month previously) before reacting to several shillings lower.

British Vacuum Cleaner

The British Vacuum Cleaner & Engineering Co., which was due to hold its annual general meeting this week, dealt conservatively with the big rise in earnings which took place up to 1951. The company is therefore able quite comfortably to maintain the ordinary dividend for last year at the previous rate of 25 per cent, despite the difficulties which affected profits in the field of domestic appliances during the period. Net earnings after tax (which included this time an E.P.L. liability) came out at not much more than half the high level recorded before, but were still double the amount distributed in the ordinary dividend, which costs under £20,000 net.

Ferranti Preference Shares

Dealings began last week in Ferranti's new £1 5½ per cent third cumulative preference shares, which have been issued to ordinary stockholders by way of a scrip bonus. The price is about 20s 9d, at which level the yield of £5 6s per cent compares satisfactorily with the return from other well-secured investments in the same category.

" Free of Stamp "

Issues of new shares, whether by way of " rights " or bonus, mean as a rule that for a few weeks they are transferable in the form of

allotment letters, and therefore free of the usual transfer stamp duty. On most occasions a corresponding adjustment is made in the Stock Exchange market between the prices of the old and new shares concerned, but most brokers note, nevertheless, a marked liking on the part of investors for shares available "free of stamp." At present in this category are the new Westinghouse Brake & Signal £1 shares, available recently at a figure about 9s 6d above the issue price of 45s, and giving an indicated yield of 5½ per cent on the 15 per cent dividend.

Company	Dividend Previous	Dividend Last	Middle Price 13th April 1953	Three Weeks' Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		£ s d
Brit. Elec. 1968/73	3	3	86½	+½	3 9 4
Brit. Elec. 1974/77	3	3	85	+½	3 10 7
Brit. Elec. 1976/79	3½	3½	91xd	—	3 17 0
Brit. Elec. 1974/79	4½	4½	100	—	4 5 0
Calcutta Elec. ..	6†	6†	20 6	—	5 17 0†
East African Power	7	7	23 -	-6d	6 1 8
Nigerian Elec. ..	10	10	22 6xd	—	8 18 0
Palestine Elec. "A"	5†	Nil	13 6	+6d	—
Perak Hydro-Elec.	Nil	Nil	15 -	—	Nil
Equipment and Manufacturing					
AberdareCables(5/-)	20	25	16 -	-3d	7 16 4
Aerialite (1/-) ..	83⅓	88⅓	9 6	—	9 6 0
Allen, W. H. ..	15	15	46 3	—	—
Aron Elec. Ord. ..	15	15	38 9	—	7 14 10
Assoc. Elec. Ord...	20	20	77 6	-1 6	5 3 3
Automatic Tel. & El.	15	15	63 -	+6d	4 15 3
Babcock & Wilcox	18	18	71 9	-1 -	5 1 0
Baldwin, H. J. (2/-)	25	20	4 -xd	—	10 0 0
Bakelite (10/-) ..	—	12½	17 6xd	—	7 2 10
British Aluminium	12	12	40 6xd	-1 -	5 18 5
B.I. Callender's ..	7½	9	35 9	-6d	5 0 8
British Thermostat (5/-)	30	30	34 6	+9d	4 7 0
British Vac. Cleaner (5/-)	25	25	13 6xd	-6d	9 5 2
Brook Motors (10/-)	20	20	35 -	-9d	5 14 3
Brush Ord. (5/-) ..	10	4	4 3	-1 -	—
A. F. Bulgin (1/-)..	30	30	3 -	—	10 0 0
Burco (5/-) ..	38⅔	35	18 9	+3d	9 6 8
Chloride El. Storage	15	15	72 -	—	4 3 4
Cole, E. K. (5/-) ..	25	25*	17 -xr	—	—
Cossor, A. C. (5/-)..	Nil	10	10 -	-6d	5 0 0
Crabtree (10/-) ..	17½	17½	31 3	-6d	5 12 0
Crompton Parkinson Ord. (5/-) ..	11½	11½	9 6	-3d	5 18 5
De La Rue (5/-) ..	50	35*	8 3	—	—
Decca (5/-) ..	112½	150	25 6	-6d	5 17 6
Dewhurst (2/-) ..	22½	19*	5 3	—	7 4 9
Dictograph Tel. (2/-)	20	20	6 -	—	6 13 4
E.M.I. (10/-) ..	12	12	13 6	-6d	8 18 0
Electrical Components (5/-) ..	20	20	10 -	—	10 0 0
Elec. Construction	15	15	55 -	—	5 9 0
Enfield Cable Ord.	7½	7½	21 -	—	—
English Electric ..	15	15	57 -	-¼	5 5 3
Ericsson Tel. (5/-)	22††	22*††	39 6	-1 -	2 15 9†
Ever Ready (5/-)..	35	35	27 6	—	6 7 3
Falk Stadelmann..	15	15	42 9	—	7 0 3
G.E.C. Ord. ..	22½	22½	42 6	—	5 6 0*
General Cables (5/-)	30	30	16 3	—	9 4 6
Greenwood & Batley	15	15	40 -	—	7 10 0
Hackbridge Cable (5/-)	20	20	12 -	—	8 6 8
Hackbridge Hewittic (5/-)	18	20	16 3	—	6 3 0
Hall Tel. Acc. (10/-)	10	10	12 6	+3 3	8 0 0
Heatrae (2/-) ..	12½	12½	1 -	—	6 5 0
Henleys (10/-) ..	20	20	18 -	—	5 11 0*
Holophane (5/-) ..	15	20*	12 6	—	8 0 0
Hoover (5/-) ..	25	25	21 9	-6d	5 15 0

Company	Dividend Previous	Dividend Last	Middle Price 13th April 1953	Three Weeks' Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		£ s d
Intl. Combustion (5/-)	25	15*	13 6	+6d	5 12 1
Johnson & Phillips	15	15	58 3	—	5 3 0
Lancashire Dynamo	22½	12½*	46 3	+6d	5 8 0
Laurence, Scott (5/-)	12½	15	14 3	—	5 5 3
London Elec. Wire	12½	12½	57 6	-9d	4 7 0
J. Lucas	7½	9⅜	40 -xd	—	4 11 8
Marryat & S. (2/-)	22½	22½	5 9	—	7 16 6
Mather & Platt ..	12½	15	48 -	-1 -	6 5 0
Metal Industries ..	10	15	15 6	-1 6	—
Mid. Elec. Mfg. ..	15	15	60 9	—	4 18 9
Murex	12½	15	57 6	-2 6	5 4 3
Newman Ind. (2/-)	10	10	2 1½xd	—	8 8 5
Oldham & Son (1/-)	30	35	2 6	—	—
Parnall (Yate) (5/-)	6	6	3 -	-3d	10 0 0
Parsons, C. A. ..	15	10*	65 -	-6 3	—
Plessey (5/-) ..	22½	25	25 6	+9d	4 18 0
Pye Deferred (5/-)	18	18	18 3	+6d	4 18 8
Revo (10/-) ..	27½	27½	46 -	—	5 19 7
Reyrolle	10	12½	55 -	-5 6	4 11 0
Scot. Cable (4/-) ..	30	32	12 9	—	—
Siemens Ord. ..	10	10	36 -	-6d	5 11 0
Southern Areas ..	Nil	5	12 9	—	7 16 10
Strand Elec. (5/-)..	17½	17½	10 6	—	8 6 8
Sturtevant (5/-) ..	16½†	17½*†	25 -	+6d	—
Switchgear&Cowans (5/-)	22½	22½	16 3xd	—	6 18 6
Taylor T. (5/-) ..	20	25	20 -	—	6 5 0
T.C.C. (10/-) ..	20	20*	38 9	+9d	—
T.C. & M. ..	10	8½*	28 -xd	-1 -	6 1 6
Telephone Mfg. (5/-)	10	10	8 9	—	5 14 3
Thorn. Elec. (5/-)..	10	12½	10 -	—	6 5 0
Tube Investments	25	15*	60/-	-2 -	5 0 0
Vactric (5/-) ..	Nil	Nil	5 -	—	Nil
Veritys (5/-) ..	Nil	7½	5 -	—	7 2 10
Walsall Conduits (4/-)	70	70	16 6	—	—
Ward & Goldstone (5/-)	45	45*	34 3	+1 9	—
Watford (2/-) ..	25	25	7 -	—	7 2 10
Westinghouse Brake	14	15	53 9	-1/16	5 11 6
West, Allen (5/-) ..	12½	15	12 -	—	6 5 0
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	6	89½	+3½	6 14 0
Ord.	—	3¾	51½	—	6 17 6
Anglo-Portuguese	8	8	23 3	+1/16	6 17 9
Brit. Elec. Traction: Def. Ord. ..	22½	25	195	-5	5 1 0
Cable & Wireless: Ord.	8	8	133	+2½	6 0 4
4% Loan ..	4	4	95	—	4 4 3
Calcutta Trams ..	6†	6†	22 9	+6d	5 5 6†
Cape Elec. Trams..	5	5½	11 6	—	9 11 4
Marconi Marine ..	10	10	30 -	-1 -	6 13 4
Oriental Tel. Ord.	16	16	61 -	+2 -	—
Telephone Props...	8	8	105 -	+4 8 9	—
Tele. Rentals (5/-)	10	10	9 6	—	5 5 3

* After capital bonus.
† Dividends are paid free of Income Tax.

REPORTS and DIVIDENDS

A. Reyrolle & Co., Ltd., are holding their annual meeting on 12th May. In his circulated statement Sir Claude D. Gibb (chairman) says that the high level of production that had been planned was not quite attained, mainly owing to the continued shortage of some essential materials in the earlier part of the year, but output for 1952, both in value and volume, was greater than the record established in 1951.

The testing station is expected to be in full operation in the autumn and when completed will have a greater short-circuit capacity than any other existing station in the world. The volume of orders received during 1952 exceeded that of any previous year. To meet the heavier commitments they stepped up their manufacturing programme about six months ago so that, with greater availability of material, they can confidently expect to give prompt deliveries. One of the outstanding contracts of the year covers all the switchgear for the Stella South and Stella North power stations of the B.E.A. These installations will comprise the initial equipment for the 275 kV super-grid link, the main 132 V outdoor switchgear and the air-break metal-clad gear for the auxiliary supplies. About one-third of the orders received in 1952 were for export.

Franco Signs, Ltd.—The annual meeting will be held on 30th April. In his circulated statement the chairman (Mr. J. F. Mallabar) says that the company can now regard the immediate post-war troubles as overcome and can look forward to the future with confidence. The sign and aircraft component businesses run by the operating company, the Franco-British Electrical Co., Ltd., have had a busy year. Franco Traffic Signs, Ltd., will be supplying a substantial proportion of the new flashing beacons for pedestrian crossings. Mr. Mallabar welcomes the removal of the restrictions on lighting, imposed during winter months, and on the use of steel for advertising signs.

The Telegraph Condenser Co., Ltd.—The main figures in the accounts were given in our last issue. Mr. P. V. Hunter (chairman) states that the turnover exceeded that of 1951, itself a record. This is only reflected in trading profit to a modest extent, as higher labour and material costs, coupled with keener selling prices, have narrowed the profit margin on many products. This is likely to continue during 1953. Shrinkage in the value of the order book, and the present rate of order intake, indicate that the turnover during 1953 will be at a lower level than for the two previous years. The anticipated fall in turnover, coupled with lower selling prices, must result in reduced trading profits during the current year.

Telephone Properties, Ltd., announces that the Venezuelan Government has expressed a desire to purchase the ordinary shares of the Compania Anonima Nacional Telefonos de Venezuela (the Nacional Co.) and negotiations are proceeding. Shareholders will be informed if any firm offer is received. The ordinary shares of the Nacional Co. are held by Telephone Properties to the extent of 83 per cent and the other 17 per cent by associated British companies.

Murphy Radio, Ltd., reports a profit for 1952, before taxation, of £415,032, as compared with £412,927 for 1951. After deducting taxation of £272,091, however, the group net profit is lower at £142,941 (against £170,551). The ordinary dividend for the year is unchanged at 10 per cent and £251,488 is carried forward (against £149,879 brought in).

Enfield Rolling Mills, Ltd., reports a consolidated trading profit for 1952 of £907,555, as compared with £1,076,453 for the preceding year, and after providing £440,000 for taxation and £93,448 for depreciation, etc., there is a net profit of £332,825 (against £426,468). Reserves receive £235,000, and it is proposed to pay a dividend of 10 per cent for the year (against 7½ per cent), plus a bonus of 5 per cent (same), making a total distribution of 15 per cent (against 12½ per cent). The balance carried forward is £169,985 (against £125,710 brought in).

Switchgear & Cowans, Ltd., reports a consolidated revenue balance for 1952 of £166,687, as compared with £138,481 for 1951. After deducting debenture interest, depreciation, etc., and £78,200 for taxation, the net balance is £22,549 (against £37,216). It is proposed to pay a dividend for the year of 20 per cent and a bonus of 2½ per cent. A similar distribution was made for the previous year on smaller capital. The balance carried forward is £68,910 (against £67,033 brought in).

Telephone Rentals, Ltd.—Consent has been received from the Capital Issues Committee to the issue of 1,120,000 fully paid ordinary 5s shares by way of capitalization of reserves. The new shares will be issued to ordinary shareholders in the proportion of one new share for every 4.714 shares held. The new shares will rank for the final dividend in respect of 1952, when declared.

New Companies

Fiesta, Ltd.—Registered 23rd March. Capital £100. Manufacturers of and dealers in electrical appliances and accessories, etc.

Directors : Mrs. M. F. A. Spong and the Hon. W. F. B. Le Poer Trench (secretary). Regd. office ; Alderman's House, Bishopsgate, London, E.C.2.

Snelsons (Yorkshire), Ltd.—Registered 27th March. Capital £25,000. Radio and television engineers, manufacturers, distributors and dealers, electrical engineers, etc. Directors : F. C. Snelson and Mrs. Marjorie J. Snelson. Regd. office : 12/22, Hunsley Street, Sheffield, 4.

Tidswell & Saunders, Ltd.—Registered 27th March. Capital £1,000. To acquire the business of radio and electrical contractors and dealers carried on by H. Hogarth, C. L. Tidswell and W. D. Saunders, at Barnoldswick, as " Uno Engineering Co." Directors : H. Hogarth, C. L. Tidswell and W. D. Saunders. Regd. office : 4, Skipton Road, Barnoldswick, Yorks.

Modernphones, Ltd.—Registered 26th March. Capital £100. Manufacturers, hirers and maintainers of and dealers in telephones, telegraphs, telewriters, radio apparatus, etc. Directors : E. Ivens and E. S. Fairweather. Solicitors : Bulcraig & Davis, Amberley House, Norfolk Street, W.C.2.

E. Shipton & Co. (Engineering), Ltd.—Registered 27th March. Capital £100. Electrical and mechanical engineers, recording and sound equipment specialists, radio engineers, etc. Directors : E. Shipton, Rebecca Shipton and B. Strong. Regd. office : Ferndown, Northwood Hills, Middx.

Liquidations

Peco (Electrical Contractors), Ltd.—Winding up voluntarily. Liquidator, Mr. R. F. Bendall, 31, Lloyd Street, Manchester, 2, appointed 30th March.

T. & H. Electrical Service, Ltd.—Meeting of members and creditors on 12th May at 11-12, Finsbury Square, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. N. Osborne.

Hudsons Radilectels, Ltd.—Members' meeting on 6th May at 13, Ship Street, Brighton, to receive an account of the winding-up by the liquidator, Mr. A. G. Lee.

W. Lawrence (St. Albans), Ltd., electrical engineers.—Winding up voluntarily. Liquidator, Mr. H. H. Hole, 20, London Road, St. Albans, appointed 2nd April.

Bankruptcies

G. W. Altass, 1, Bruce Avenue, Shepperton, Middx, electrical engineer and general contractor.—Receiving order made 1st April on a creditor's petition. First meeting 22nd April at 3, Central Buildings, Matthew Parker Street, Westminster, S.W.1. Public examination 9th June at the Guildhall, Kingston, Surrey.

C. E. Ross and **T. E. Perks**, trading as Ross & Perks, 166, Piccadilly, London, W.1, electrical engineers.—Trustee, Mr. R. Mountstephen, 18, Copsem Drive, Esher, Surrey, released 19th December, 1952.

TRADE MARK APPLICATIONS

APPLICATION has been made for the registration of the following trade marks, objections against which may be entered up to the dates mentioned:—

25th April

CONTACTRODE. No. 714,712, Class 6. Welding rods of common metal.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

NIKALIUM. No. 713,126, Class 7. Water turbine components and parts included in Class 7, all being made of nickel aluminium bronze.—Manganese Bronze & Brass Co., Ltd., 63, Grosvenor Street, London, W.1.

INTERCHIEF. No. B693,851, Class 9. Telephone instruments and apparatus for use in internal communicating systems.—E. Shipton & Co., Ltd., Ferndown Works, Northwood Hills, Middlesex.

UNITEL (design). No. 709,528, Class 9. Television and radio receiving and transmitting instruments and parts included in Class 9; kits of parts for building these instruments; and electronic measuring and testing instruments. —Nugard, Ltd., trading also as Unitel Electric, 63-4, New Broad Street, London, E.C.2.

SIERA (design). No. 712,744, Class 9. Instruments and apparatus for radio, television, telegraphy, telephony and telecommunication; instruments and apparatus for recording, reproducing and amplifying sound; electric measuring apparatus and instruments; electric discharge tubes included in Class 9; vacuum cleaners, domestic electric floor polishing machines, electric flat irons, electric kettles and coffee percolators; and parts and fittings included in Class 9. No. 712,745, Class 11. Electric lighting installations, electric lamps, headlamps, vehicle reflectors, vehicle rear lights; refrigerators, electric toasters, electric stoves, ovens, kitchen ranges, heating apparatus, electric milk boilers, electric pressure cookers, water heaters, boilers (not being parts of machines), fans (ventilating), hair drying apparatus, fires, immersion heaters, radiators, hot-plates, electric kitchen utensils (included in Class 11) and parts and fittings included in Class 11.—N. V. Siera, The Hague, Holland. Address for service c/o T. D. Threadgold, Century House, Shaftesbury Avenue, London, W.C.2.

CERE-NEG. No. 714,675, Class 11. Carbons for electrical purposes.—Charles H. Champion & Co., Ltd., National House, 60-66, Wardour Street, London, W.1.

1st May

TELYTROL. No. 713,172, Class 9. Apparatus embodying an electric relay used in a bridge circuit for indicating or controlling position, quantity or condition.—Measurement, Ltd., Terminal House, Grosvenor Gardens, London, S.W.1.

RUBICON. No. 715,044, Class 9. Electric heating elements included in Class 9.—Controlled Heating Units (London), Ltd., Avenue Road, Hampton, Middlesex.

SILERTEX. No. 715,290, Class 9. Electrical resistances; and condensers, suppressors, potentiometers and volume controls, all being electrical apparatus.—Erie Resistor, Ltd., 2, Carlisle Road, The Hyde, Hendon, London, S.W.9.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 27th May, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

26655. Bader, K. E.—Electric heating apparatus for typesetting and composing machines and the like. 30th September, 1948. (691961.)

32709. Hazeltine Corporation.—Pulse generator. 11th December, 1947. (692180.)

1948

15815. Standard Telephones & Cables, Ltd., and Ridler, D. S.—Gas-filled electric discharge tubes and circuit arrangements therefor. 11th June, 1948. (691901.)

17203. Thorn Electrical Industries, Ltd., and Bloxsidge, W. R.—Supply circuits for electric-discharge tubes. 15th June, 1949. (691902.)

29603. Wright & Weaire, Ltd., and Niblett, E. H.—Electromagnetic devices. 15th December, 1949. (691903.)

1949

22915. British Thomson-Houston Co., Ltd., and Blackman, P. G.—Formers for winding coils. 31st July, 1950. (692026.)

24323. Tucker & Co., Ltd., J. H., and Avison, R. G.—Electrical plug and socket connectors. 11th September, 1950. (692143.)

24618. Electric & Musical Industries, Ltd.—Negative feedback amplifiers. 6th September, 1950. (691909.)

28938. Philco Corporation.—Object locating systems. 11th November, 1949. (691968.)

30312. Metropolitan-Vickers Electrical Co., Ltd.—Moulding mixtures. 8th November, 1950. (692030.)

33225. Western Electric Co., Inc.—Methods of heat treating germanium material. 29th December, 1949. (692094.)

1950

856. Elliott Bros. (London), Ltd.—Rigid frameworks for polyhedral structures. 12th January, 1951. (691947.)

3427. Electric & Musical Industries, Ltd.—Radio and television receivers. 12th February, 1951. (692032.)

4352. Union Carbide & Carbon Corporation.—Automatic control for electric welding. 20th February, 1950. (692095.)

4783. Dobbie McInnes, Ltd.—Electrical viscometers. 31st May, 1951. (692035.)

6832. Graviner Manufacturing Co., Ltd., Wilkinson Sword Co., Ltd., and Mathisen, A.—Aircraft provided with electric systems including crash or impact detecting devices. 1st March, 1951. (691972.)

13041. British Thomson-Houston Co., Ltd.—Electric motor control systems. 24th May, 1950. (692099.)

14447. Philips Electrical Industries, Ltd.—Scintillation detectors for alpha particles. 5th June, 1951. (691925.)

15952. Reyrolle & Co., Ltd., A.—Welding generators. 31st August, 1951. (692155.)

15953. Reyrolle & Co., Ltd., A., and Bayles, J. W.—Dynamo-electric machines. 26th June, 1951. (692156.)

16677. Parmeko, Ltd.—Automatic control of electrical load circuits. 4th July, 1951. (691931.)

19700. Philips Electrical Industries, Ltd.—Holders for tubular electric lamps. 8th August, 1950. (691977.) 19701. Lamp caps for tubular electric lamps. (691978.) 19702. Holders and caps for tubular electric lamps. (691979.) 19703. Holders for tubular electric lamps. (691980.)

20819. Parsons, Ltd., C. H., and Handley, G. E.—Lever-operated electric switches. 19th July, 1951. (692043.)

23799. Whitehead, E. A. N.—Attenuators for use in connection with the transmission of electromagnetic waves through waveguides or the like. 28th September, 1951. (691939.)

27061. British Thomson-Houston Co., Ltd., Wild & Co., Ltd., M. B., Batty, A. W. H., and Liddiard, H. W. C.—Braking control systems for winders and the like. 27th September, 1951. (691982.)

30942. Westover, C. D.—Indicating means for radio tuning devices. 19th December, 1950. (692054.)

1951

1299 & 1300. Standard Telephones & Cables, Ltd., and Ridler, D. S.—Gas-filled electric discharge tubes and circuit arrangements therefor. 11th June, 1948. (691946 7.)

1932. Telefonaktiebolaget L. M. Ericsson.—Counting apparatus. 25th January, 1951. (691992.)

3233. Gassmann, V. O.—Radio-telephonic selecting and recording arrangements. 9th February, 1951. (692117.)

5322. Automatic Electric Laboratories, Inc.—Excess voltage protective device of the spark gap type. 5th March, 1951. (692062.)

7460. Sangamo Weston, Ltd.—Temperature measuring apparatus. 30th March, 1951. (692064.)

10232. Radio Corporation of America.—Cross talk eliminating apparatus in a time division multiplex system. 1st May, 1951. (691952.)

10988. Hoover, Ltd.—Suction cleaners. 10th May, 1951. (692171.)

13030. Maschinenfabrik Oerlikon.—Method of regulating gas turbine plants. 1st June, 1951. (692072.)

16231. British Thomson-Houston Co., Ltd.—Electronic motor control systems. 9th July, 1951. (691954.)

17746. Sperry Products, Inc.—Ultrasonic inspecting devices. 26th July, 1951. (692001.)

18102. Philips Electrical Industries, Ltd.—Frequency-stabilizing circuits for frequency-modulated oscillators. 3rd August, 1951. (692003.)

19115. Goodwin, S. (Ellis, G. H.).—Electric hot-plates. 17th August, 1951. (692128.)

21172. Hoover, Ltd.—Floor polishers. 7th September, 1951. (692077.)

22897. Beer, H. B.—Arrangement for accumulating energy of a bicycle dynamo during cycling. 2nd October, 1951. (692079.)

1952

3735. Askania Regulator Co.—Dynamo-electric pulse generators. 12th February, 1952. (692014.)

20142 3. Bader, K. E.—Thermally-actuated electric switching arrangements. 30th September, 1948. (692017 8.)

Belgian Congo Project

Consideration is being given in Brussels to a plan for the building of a power station at Kitimba, on the Ruzizi river, between Lakes Kivu and Tanganyika. The capacity is given as 20,000 kW.

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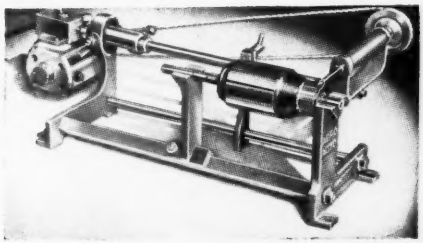

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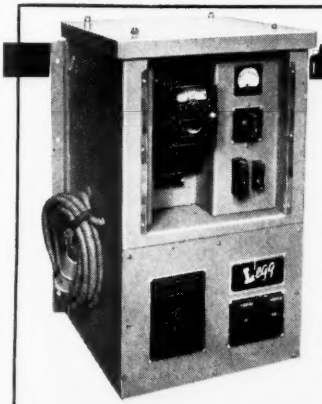

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RECTIFICATION. This section will demonstrate a new method of METAL MACHINING BY SPARK DISCHARGE including some entirely new operations. The CONSTANT CURRENT SYSTEM of CATHODIC PROTECTION AGAINST CORROSION will be shown working to protect a pier and dock installation including a ship's hull in harbour. The TRANSBOOSTER—Constant Potential Rectifier Equipment—is capable of holding D.C. output voltages to within limits of plus or minus 1% under varying load conditions, mains variations of plus 6 or minus 10% and supply frequency variations of up to minus 4%. Westalite Rectifier equipment for electro-deposition, stud welding and vehicle battery charging complete this section.

COLLIERY EXHIBITS. Includes pneumatic decking plant. Also a combined stop and restarter for tubs and mine cars will be shown for the first time. Various types of control and auxiliary valves will be shown.

RAILWAY SIGNALLING. Automatic signalling using Coded Track Circuits will be demonstrated. Also exhibited will be a selection of A.C. and D.C. plug-in relays, point valves and terminal blocks.

ROAD BRAKES. A Westinghouse compressor will be supplying air to demonstrate various methods of pneumatic control.

WESTINGHOUSE BRAKE & SIGNAL CO. LTD., 82 YORK WAY, KING'S CROSS, LONDON, N.1

German Electrical Exports

Substantial Increase in 1952

INCREASING German competition in world electrical trade has been reported from time to time in these columns. Striking and detailed evidence of this great renewal of activity has now been made available by the publication of the import and export trade returns of the Federal Republic for 1952. The aggregate value of the exports from Western Germany of electro-technical products, including machinery, in that year amounted to about DM. 1,060 million, representing a rise of about 70 per cent on 1951.

At the end of September, 1951, the classification of the returns was revised. It was made more comprehensive, groups being split up and numbers of new headings being raised. In addition the generator group became classified according to capacity instead of weight as formerly. These changes preclude any exact comparison of individual items last year with those of preceding years. On a rough estimate exports of power plant seem to have more than doubled in value and cable more than trebled, while increases of a third or more took place in telegraph and telephone material, radio apparatus, and lighting and starting equipment for i.c. engines. It may be assumed that the many items which in 1952 appeared separately in the returns for the first time represented a major contribution to the overall advance. In the accompanying statement giving the values of exports under the revised classification, there is not space to mention more than a very few of the chief customer countries. Large numbers are recorded in the returns, e.g., over 70 as markets for generating sets.

Class	1952 DM. (000)
Generators, motors, transformers, convertors, etc., up to 10 kW	33,163
To Belgium	2,728
,, *Holland*	2,542
,, *Norway*	2,502
,, *Sweden*	5,493
,, *Switzerland*	1,394
,, *Turkey*	1,954
,, *Brazil*	2,504
Ditto, 10 to 1,000 kW	58,073
To Finland	3,056
,, *Holland*	5,319
,, *Norway*	4,206
,, *Sweden*	10,137
,, *Turkey*	2,525
,, *Brazil*	5,603
Ditto, over 1,000 kW	12,618
To Norway	1,595
,, *Sweden*	2,142
,, *Spain*	2,096
Generating sets	112,346
To Denmark	8,201
,, *Italy*	5,439
,, *Turkey*	5,707
,, *Indonesia*	5,646
,, *India*	8,370
,, *Argentina*	15,501
,, *Brazil*	15,351
Transformers and choking coils	43,317
To Finland	3,299
,, *Yugoslavia*	3,169
,, *Holland*	2,976
,, *Norway*	3,195
,, *Sweden*	8,186
Current regulators	8,767
To Belgium	583
,, *Luxemburg*	812
,, *Holland*	510
,, *Sweden*	653
,, *Hungary*	2,590

Class	1952 DM. (000)
Electro-magnetic apparatus	2,556
To Italy	156
,, *Holland*	238
,, *Austria*	290
,, *Sweden*	496
,, *Switzerland*	324
Permanent magnets	1,775
To Finland	184
,, *Sweden*	343
,, *Hungary*	401
Primary cells and primary batteries	5,367
To Finland	410
,, *Sweden*	386
,, *Turkey*	1,732
,, *Iran*	702
Accumulators	15,655
To Holland	901
,, *Turkey*	2,448
,, *Egypt*	2,148
,, *South Africa*	702
,, *Iran*	1,028
Elec. operated tools and machine tools	20,549
To Holland	1,663
,, *Sweden*	1,185
,, *Switzerland*	1,796
,, *Brazil*	1,735
,, *Belgium*	1,356
Vacuum cleaners and floor polishers, household	9,149
To Belgium	1,424
,, *Italy*	1,259
,, *Holland*	821
,, *Sweden*	845
,, *Switzerland*	725
Washing machines, household	18,741
To Belgium	3,245
,, *Holland*	5,253
,, *Switzerland*	1,980
,, *Turkey*	1,605

(*Continued on next page*)

GERMAN ELECTRICAL EXPORTS (CONTINUED)

Class	1952 DM. (000)
Fans, up to 600 W	1,305
To Italy	135
,, *Turkey*	147
Other household appliances up to 15 kg	3,283
To Belgium	579
,, *Italy*	160
,, *Sweden*	398
,, *Switzerland*	656
,, *Uruguay*	269
Shavers and hair cutters	2,743
To Italy	267
,, *Holland*	425
,, *Sweden*	492
,, *Brazil*	203
Ignition equipment for i.c. engines, semi-diesel or diesel engines	12,550
To Belgium	1,345
,, *Italy*	515
,, *Holland*	949
,, *Austria*	1,130
,, *Sweden*	1,637
Elec. equipment, n.e.i., for cycles, motor cycles, motor vehicles, aircraft, ships or other vehicles	41,789
To Belgium	3,227
,, *Holland*	3,875
,, *Sweden*	8,342
,, *Indonesia*	2,863
,, *Malaya*	2,509
Elec. welding apparatus	10,126
To France	541
,, *Italy*	464
,, *Holland*	753
,, *Turkey*	790
,, *Brazil*	1,724
Elec. ovens, industrial and household	22,700
To France	1,600
,, *Norway*	1,200
,, *Sweden*	1,600
,, *Japan*	2,424
,, *Brazil*	1,150
Pressing irons	4,183
To Belgium	584
,, *Holland*	461
,, *Turkey*	409
Other heating appliances and parts	12,360
To Belgium	1,345
,, *France*	857
,, *Italy*	1,100
,, *Switzerland*	1,437
Portable elec. lamps with batteries and the like	3,987
To Yugoslavia	122
,, *Holland*	597
,, *Turkey*	778
Radiological apparatus and accessories	32,016
To Holland	1,566
,, *Sweden*	1,921
,, *Spain*	1,565
,, *Brazil*	3,405
Electro-medical, surgical and dental apparatus	14,236
To Denmark	1,369
,, *Italy*	1,116
,, *Holland*	1,054
,, *Switzerland*	1,332
,, *Brazil*	1,181
Telephonic apparatus	32,858
To Saar	2,578
,, *Finland*	2,385
,, *Italy*	6,948
,, *Holland*	3,557
,, *Pakistan*	2,568
Telegraphic apparatus	10,714
To Belgium	1,116
,, *Holland*	1,297
,, *Sweden*	1,606

Class	1952 DM. (000)
Microphones, amplifiers, loudspeakers, etc.	2,272
To Sweden	218
,, *Switzerland*	200
,, *Hungary*	197
Elec. hearing aids	767
To Denmark	78
,, *France*	78
,, *Holland*	117
,, *Sweden*	93
Radio apparatus	78,292
To Belgium	5,393
,, *Holland*	7,541
,, *Switzerland*	7,096
,, *Turkey*	13,881
,, *Indonesia*	2,701
,, *Egypt*	2,475
,, *Greece*	2,857
Supersonic or electro-magnetic echo-sounding apparatus and detectors	5,877
To Denmark	553
,, *Norway*	1,622
,, *Portugal*	712
,, *Sweden*	759
Signalling and safety apparatus	4,793
To Belgium	418
,, *Greece*	451
,, *Holland*	426
Elec. goods and apparatus, n.e.s.	11,661
To Yugoslavia	2,210
,, *Switzerland*	1,152
,, *Mexico*	1,727
Elec. condensers	4,371
To Holland	477
,, *Sweden*	465
Current or voltage controlling, regulating or distributing apparatus	68,217
To Saar	4,651
,, *Belgium*	3,500
,, *Italy*	3,836
,, *Yugoslavia*	9,300
,, *Holland*	5,377
,, *Austria*	4,842
,, *Sweden*	6,328
Cable	72,285
To Luxemburg	5,600
,, *Finland*	4,114
,, *Yugoslavia*	6,301
,, *Sweden*	9,728
Insulated wire, flex, etc.	37,187
To Greece	1,307
,, *Great Britain*	2,557
,, *Yugoslavia*	1,609
,, *Sweden*	4,866
Carbons, etc.	18,409
To Sweden	2,169
,, *Switzerland*	1,361
,, *Spain*	2,674
Insulators	10,822
To Italy	1,267
,, *Yugoslavia*	2,099
,, *Austria*	1,135
Parts of insulating materials	6,28
Conduit, tubing, etc.	1,91
To Turkey	37
,, *Iran*	33
Elec. lamp bulbs and tubes	13,07
To Belgium	60
,, *Holland*	99
,, *Norway*	1,05
,, *Sweden*	1,79
,, *Chile*	53
Thermionic or electronic tubes and valves (not for lighting)	9,02
To Denmark	92
,, *Italy*	1,19
,, *Holland*	1,60
Other parts of elec. machinery and apparatus	3,08

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Armagh.—6th May. St. Luke's Hospital Management Committee. Supply, laying and jointing of paper insulated underground cables and supply and delivery of main switchboard and sub-switchboards at St. Luke's Hospital. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

Australia.—ADELAIDE.—28th April. Electricity Trust of Australia. Four 3-unit oil immersed isolator switchboards. (C.R.E. 12963/53. Ten/6127.)*

Bridlington. — 25th April. Corporation. Supply or hire of decorative strip lighting. (See this issue.)

Greece.—ATHENS.—25th April. Ministry of Finance, State Procurement Service. Supply of electric cable and wire. (C.R.E. 12106/53. Ten/6089.)*

Hyde. — 25th April. Borough Council. Lanterns, brackets, etc., and electrical equipment for eighty-eight sodium units and seven fluorescent units, for street lighting scheme A.57. Borough surveyor, Municipal Buildings, Greenfield Street.

India.—NEW DELHI.—26th May. Director General of Supplies and Disposals. Supply of 200 railway carriage fans. (C.R.E. 12198/53. Ten/6105.)*

MADRAS.—10th June. Government Electricity Department. Supply of fifty-eight power transformers of varying capacities. (C.R.E. 12645/53. Ten/6131.)*

New Zealand.—WELLINGTON. 9th June. State Hydro-Electric Department. Supply of one 50,000 kVA transformer bank for Otahuhu substation. (Tender No. 222). (C.R.E. 12117/53. Ten/6083.)* One 50,000 kVA transformer bank for Haywards substation. (Tender No. 223). (C.R.E. 12118/53. Ten/6085.)* 14th July. One 5,000 kVA transformer for Blenheim substation. (C.R.E. 12524/53. Ten/6118.)*

Skelton and Brotton (Yorks). — 27th April. U.D.C. Electrical wiring, etc., of 18 houses at Brotton and 16 at Boosbeck. Surveyor, Council Offices, Skelton-in-Cleveland.

South Africa.—JOHANNESBURG.—29th April. South African Railways. Supply of two 400 kVA transformers. (C.R.E. 12336/53. Ten/6106.)*

27th April. City Council. Supply of 1¼ miles of 11 kV lead covered cable. (C.R.E. 12903/53. Ten/6129.)*

Southampton.—Corporation. Electrical subcontract to 138 houses, Harefield. (See this issue.)

Southern Rhodesia. — SALISBURY. — 24th April. Department of Posts and Telegraphs. Supply of 500,000 yards of p.v.c. insulated telephone wire. (C.R.E. 11399/53. Ten/6088.)*

Tangier.—29th April. Administration of Water and Electricity Services. Supply of l.v. electrical equipment for a pumping set at Charfel-Akot waterworks. (C.R.E. 10656. Ten/6068.)*

ORDERS PLACED

Birkenhead.—Corporation Housing Committee. Electrical installations in 24 houses, Fairview Road (£968).—Abbey Radio & Electrical Co., Ltd. (in lieu of tender withdrawn).

Caterham and Warlingham. — U.D.C. Housing Committee. Installation of electricity in 30 houses, Woldingham and Warlingham (£910). —Purley Electrical Co.

Cockermouth. — U.D.C. Recommended. Electrical installations in 100 houses on the Windmill Lane Nos. 1 and 2 estates (£2,408).—North Western Electricity Board.

Longbenton (Northumberland).—U.D.C. Electrical installations in 20 houses on the Croft estate and 32 houses on the Wideopen estate.—J. B. Wilson.

Manchester.—Corporation Education Committee. Electrical installations in schools.—Oldwood County Primary and Woodhouse Park County Primary Schools.—Hartley Electromotives, Ltd. Haveley Hey Primary School.—Hallams (Electrical Contractors), Ltd. Electrical installation at Great Moreton Hall.—Casson Electric Co., Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Flats (132), Denmark Street; borough surveyor.

Alnwick.—Houses (22), Longhoughton, for R.D.C.; Reavell & Cahill, architects, Lloyds Bank Chambers, Alnwick.

Ashford (Middx). — Ambulance station; Middlesex county architect, 1, Queen Anne's Gate Buildings, Dartmouth Street, S.W.1.

Boldon (Co. Durham).—Medical centre at Boldon Colliery; G. T. Brown & Son, Bank Chambers, Fawcett Street, Sunderland.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, House Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Chelmsford.—Flats (26) and shops on the Chignal estate; borough surveyor, Duke Street.

Cookley (Kidderminster). — Training school for industry at Cookley Works (£35,000); Richard Thomas & Baldwins, Ltd., Brierley Hill.

Corby.—Grammar school near Oakley Road; county architect, County Offices, Northampton.

Crediton. — Housing estate, Butts Park; Beech & Curnow Cooke, architects, 15, Dix's Field, Exeter.

Crewe.—Training school for British Railways; Architects' Department, Euston Station, London.

Croydon.—Church hall, Lower Addiscombe Road; Scherrer & Hicks, architects, 19, Cavendish Square, W.1.

Works and offices, Beddington Lane; E. H. Smith, Ltd., 48, Wellesley Road.

Houses (36), off Gravel Hill, Addington; New British Garden Estates, Ltd., 1/3, Addiscombe Road.

Dagenham.—Houses and flats (66), Manor Road estate; K. Lauder, town clerk, Civic Centre.

Dartford.—Houses (54) on sites at Darenth and Horton Kirby; surveyor, Rural Council Offices, West Hill.

Exeter.—Shops and maisonnettes (14), South Street; city architect.

Hinckley.—Central omnibus station (proposed); surveyor, Urban Council Offices, Station Road.

Keighley.—Houses (26), Thwaites Brow; borough surveyor, College Street.

Kidderminster.—School at Birchen Coppice for County E.C.; F. R. S. Yorke, architect, 2, Hyde Park Place, London, W.2.

Leamington.—Flats (72), Brunswick Street; C. O. Innes-Jones, borough surveyor, Town Hall.

London.—HOLBORN.—Flats (30), Endsleigh Street; Pitchers, Ltd., builders, 57, Ashburton Grove, N.7

KENNINGTON.—Nurses' home, Newburn Street; Louis de Soissons & Partners, architects, 3, Park Square Mews, N.W.1.

LEWISHAM. — Community centre, Sydenham Road; J. Carr, borough engineer, Lewisham Town Hall, Catford, S.E.6.

Longbenton.—T.A. centre for Northumberland T.A. and A.F. Association, Jesmond, Newcastle-on-Tyne.

Maldon.—Houses (38), St. Peter's Avenue; borough surveyor, Municipal Offices, Market Hill.

Newcastle-on-Tyne. — Temporary factory in Roman Avenue for McLure & Co., Ltd.; C. S. Errington, architect, 46, Grainger Street.

Additions to premises in Westmorland Road for Ernstone & Sons; M. Gatoff, architect, Trafalgar Street.

Showrooms for N. H. Chapman & Co., Ltd., 24, Great North Road.

Flats in Buckingham Street (9), Guildford Place (21) and Tarset Street (12); city architect, 18, Cloth Market.

New works, Huddlestone Road, for Universal Joinery Works, Ltd.; P. Higg, 78, Denham Gardens.

Six new schools, 1953-54 programme; county architect, County Hall.

Nuneaton.—Houses (140), with shops, etc., on further section of Camp Hill estate; G. Ashton, borough surveyor, Council House.

Oakham.—Houses (12), Empingham Road site, Exton; R.D.C. architect, Oakham, Rutland.

Peterlee (Co. Durham).—Houses (500) in north-west section of town for Peterlee Development Corporation; chief architect, Shotton Hall, Castle Eden, Co. Durham.

Ramsey.—Secondary modern school; H. J. Firman, Woodfield Road, Peterborough.

Rochdale.—Houses (44), Higher Moss estate; Gaunt, Foster & Hill, solicitors, Halifax House, 62, Moorgate, London, E.C.2.

Romsey.—Flats (24), Botley Road; borough surveyor.

St. Neots (Hunts).—Houses (22), Little Paxton, Huntingdon; D. J. Dear, clerk, 32a, New Street.

Smethwick.—Additional wing to Council House for Public Health Department; R. Fletcher, borough surveyor, Council House.

Solihull.—Special day school for 60 educationally sub-normal children; surveyor, 90, Station Road, Solihull, near Birmingham.

South Shields.—Rebuilding of Market Place (£100,000); borough engineer.

Houses (77), Simonside; W. D. & R. Allison, builders, Whitburn, South Shields.

Stafford.—New pumping station at Milford; G. J. Plant, water engineer, Mount Street.

Stalybridge.—Shops and flats at Millbrook; Howard & Benson, architects, 88, Mosley Street, Manchester.

Stockton-on-Tees. — Houses (26), Roseworth; Moore & Cartwright, builders, Mount Pleasant Road, Stockton.

Houses (26), Ramsbury Avenue; borough architect, 28, The Green.

R.C. Church, Redhill Road; M. Trotter, architect, 134, High Street.

Thornaby-on-Tees. — Children's home in Northumberland Road for North Riding C.C.; county architect, County Hall, Northallerton.

Tiverton.—Children's home; county architect, Heavitree Road, Exeter.

Towcester.—Extensions to County Modern School (£14,000); county architect, County Offices, Northampton.

Tynemouth.—R.C. church, Wallsend Road; R. Burke, architect, Lambton Road, Jesmond, Newcastle-on-Tyne.

Presbyterian church, Verne Road and Bellister Road; Tasker & Child, architects, 25, New Bridge Street, Newcastle-on-Tyne.

R.C. secondary school, Lynn Road, and secondary technical school, Argyle Terrace; borough engineer, 16, Northumberland Square, North Shields.

West Ham.—Dwellings (33) at Barking and Bushey Roads, and flats and maisonnettes (72) at Disraeli Road; Thomas E. North, planning officer, 70, West Ham Lane, E.15.

Whitby. — Additions to Whitby Museum (£12,000); W. Garbutt & Sons, builders, Sleights, Whitby.